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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLVII. No. 3069.] LONDON, MARCH 8, 1922. [74TH YEAR. PRICE 1s.

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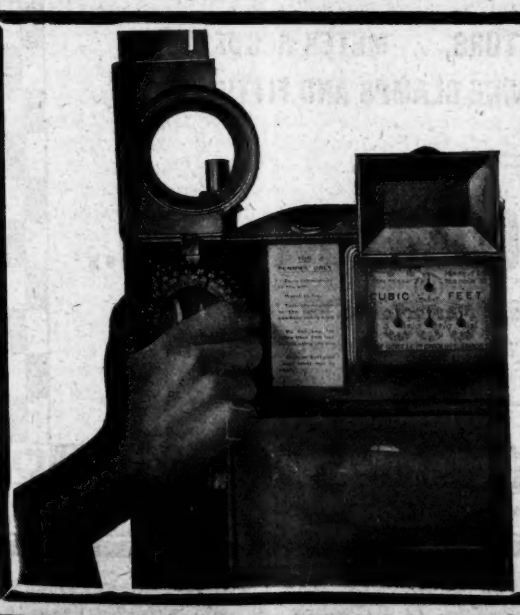

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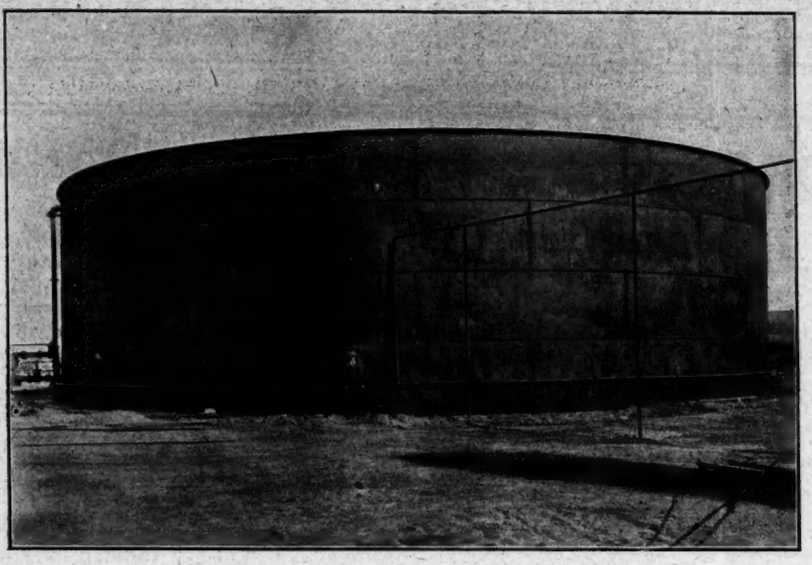

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VOL. CLVII., No. 3069.] WEDNESDAY, MARCH 8, 1922. [74TH YEAR.

EDITORIAL NOTES.

Works Maintenance and Extensions.

SOME of the makers of heavy gas plant are finding it difficult to keep their works open and to give employment to many of their old hands. The rush of essential work that followed the war has abated, and now very largely in gas-works a marking-time policy is being followed in respect of reconstructions and extensions. In the accounts of gas undertakings for the past year, there have been lighter charges for repairs and maintenance; and probably a factor that had some weight in this economy and in shaping policy was the coal strike, and a desire not to raise the price of gas any higher than was imperative. Those lighter maintenance charges can be only a temporary matter; and the excuse of dear money for entering upon extensions has not the same validity as it had but twelve months ago. This fact, together with reduced prices of materials and labour, should ensure more immediate liveliness in the work of reconstruction and extension. What, however, seems to be happening now is that the official advisers of gas undertakings are waiting. There is some uncertainty among them as to whether bottom prices have been reached, to realize which they can afford to delay work. They are hoping for something lower. We are afraid that any appreciably lower prices than those now ruling will exist more in imagination than in actuality. Some of our manufacturers of gas plant can point to a large amount of unemployment among the men they ordinarily employ; and they can show works that are not being operated at the highest efficiency through the slackness in orders and the smallness of those they have in hand. To keep their works open and men employed whose services it is desired to retain, contracts we know have been in some cases entered into at prices that do not give a profit on the transaction.

In view of all the circumstances, there does not appear to be any reason to suppose that there is much chance of any considerable fall of prices below current levels; and so we doubt whether there is anything much to be gained by further delay in inviting tenders and giving out orders for work within sight. We are rather inclined to the view that presently there will be a spurt in business in reorganizing plant to enable the largest possible benefit to be obtained from the Gas Regulation Act. The line of procedure will be evolution, and not drastic revolution. One cannot, of course, afford to scrap pre-war cheap plant for more expensive plant if the former is in a condition in which it can be renovated and improved, unless the difference in efficiency and economy is such that the new and more expensive plant will pay well for itself in higher result. The "declared" calorific value under the Gas Regulation Act is going largely to control immediate work. What every gas engineer particularly wants now is to be put into a position with his manufacturing plant that in all circumstances, whether of gas demand or variations in coal quality, he will have the necessary elasticity in his processes and operations to enable him to work at any time and under all conditions as closely to the declared value as is possible, so that the declared value will be given at the extremes of the district. That is the guiding-line for immediate work, which means that no single stereotyped carbonizing process will be regarded as sufficient by most engineers. There are other considerations. With the reduction of calorific values per cubic foot, enlargements of plant other than carbonizing and gasifying will be required for dealing with the greater volumes; and if the winter heating load is going to develop by leaps and bounds in the future, this will likewise mean a revision of estimates as to maximum plant capacities. In the circumstances of the times, the conditions are now, we think, of a more favourable nature than they have been for some time past for considering gas-plant reconstructions and extensions; and in deliberating over them, sight should not be lost of the need to look ahead with generous estimates in mind.

The Manchester Address—Management and Collective Coal Purchasing.

THE President of the Manchester District Institution of Gas Engineers (Mr. Harold Davies, of Chesterfield) on Friday last treated the members to an Inaugural Address of large scope and many parts; but, extensive as it was, and constituted of such diversified subject-matter, there was no absence of interest at any point. There was breadth of vision in it, sound enunciation of practical policy, and much suggestion, in which suggestion there was at least one matter which is of a nature which may incite controversy in respect of practicability. Such an address as this invites comment upon every part; but reluctantly there has to be rejection of the invitation, and selection has to be made. The subject of most general interest is that which is the main thought of every responsible chief to-day, namely as to how he can compass the difficulties of the times, and utilize that which he has, or which he is about to possess, in working to the best advantage for his undertaking and the consumers under the new conditions which the Gas Regulation Act has fortunately imposed. The difficulties of the past few years have been eased within the last few months; but the circumstances are not as they were prior to the war. Difficulties have left their impression upon operation and management; and there is material expression of them still in the accounts of all gas undertakings. We hear of the resources of undertakings having been severely taxed; we hear less of the severe taxing of the resources of the chief officials, and of the tremendous accretion of their responsibility which such times as those we have passed through, and have confronting us, bring about. As to those confronting, the determinations of these times bear upon the attainment of maximum present prosperity and future developments, though no gas engineer and manager can escape such outside business-restricting influences as the current depression of trade. In any circumstances however, the best has to be done; and when circumstances do not present maximum helpfulness, then the skill of the chief executive official is shown at its best, though perhaps not always recognized as it should be in administrative quarters.

On the advice of the chief official (as the President points out) raw materials have to be purchased; they have to be manufactured into gas and other commodities; and then there has to be the sale of the manufactured goods in various markets. All this involves much. There are factors in the buying of raw material which are not always taken into account. One is that raw material should be purchased that is economically the best. It may be good policy to buy the coal nearest at hand, and so save the heavy cost of transport; on the other hand, it may be better to buy coal farther away and pay carriage if the local market demands (say) a good coke, which the nearest available supply of coal may not be physically fit to yield. But an important thing is that the carbonizing plant should be of a type that will give the best results with the coal purchased. Mr. Davies has seen much incongruity between carbonizing plant and the coal bought for use in it. Unsuitability between the two is

bad engineering and bad management. In designing plant there should be a careful consideration of its adaptability to the coal that it is economically the best to purchase. On the question of the sale of products, Mr. Davies emphasized the value of the District Commercial Sections; and, in his opinion, a greater association of gas undertakings with these should prevent undercutting in each other's districts in the disposal of coke.

This brings us to the suggestion that Mr. Davies makes, and over which we think opinion may not run parallel. Coal is the most important factor in the purchasing operations of all gas undertakings; and the President therefore considers that gas-works large and small would benefit by collective bargaining for coal. His idea is that a Coal Purchasing Committee should be appointed, presided over by the ablest commercial man in the gas industry, with power to purchase the millions of tons of fuel (the whole output of collieries if desired) required by the gas industry. This looks as thoroughly simple as it is thoroughly ambitious. Reflection upon it leads to the view that its original simplicity would develop into a lot of complicated machinery. The Central Committee would find it necessary to have branches in all coal centres; and we should not envy the Committee and its able commercial chairman unless there were supervising staffs in all centres to see that consignments of coal were up to the quality bargained for, and were dispatched to time. The Purchasing Committee would have to keep a huge and expensive staff to deal with all questions and correspondence that would be involved regarding purchase, delivery, quality, and all sorts of matters that crop-up in connection with the supply of coal to gas-works. We doubt, too, whether the big undertakings whose requirements mean purchasing power to them individually would throw their superior position into the pool, and abandon any other advantage they may at present possess in respect of liberty. There would have to be average prices for different qualities of coal; otherwise we can well see the smaller and [medium sized concerns charging the larger undertakings with securing benefit at their expense. To compose all the differences of position—geographical and quantitative—between undertakings and the prices they would have to pay would be an immense piece of work, and without, we fear, satisfaction to all. We doubt, too, whether the colliery owners would look sympathetically upon such combined purchasing; and we can quite imagine that they would take into consideration the question of the line of policy they should pursue in respect of it. At any rate, the proposal, if established, would rule-out general competition so far as home gas-coal requirements are concerned. But at the moment we do not think the probability of establishment will disturb anyone. If such an arrangement would benefit the whole industry, by all means let us have it. But the difficulties that we foresee do not assist us to believe that the plan will materialize, or that, if it did, it would be a smooth-running piece of machinery.

The President regards with great favour the Gas Regulation Act, the authorization of which will confer benefit not only upon the gas industry, but upon the gas consumers. It is difficult to get some people to see this; and we rather think this is due to superficial consideration. An important matter for the gas engineer to determine in this connection is how near he can with safety work to the declared calorific value per cubic foot, and how he shall order his methods to realize proximity to it. In all probability, Chesterfield will declare a value of 450 B.Th.U. Mr. Davies is now working to 480 B.Th.U. He told in his address of moderate plan reorganizations and additions at his works whereby he gains in manufacturing elasticity and quality control. To have both these characteristics in manufacturing plant is something that all engineers should seek to attain. Another interesting section of the address has reference to distribution in relation to area extensions. Extensions of supply areas bring in their train new conditions and new obligations; but the value of area extension in economic development cannot be neglected because it means additional engineering responsibilities and work. The President shows how he has dealt with the enlargements of his area, and how, contributory to his own gas output, he has now a coke-oven supply.

By bringing three other parts of the address into juxtaposition, there is rather an anomalous condition of things presented in respect of business instinct and policy. The President indicates how his Council, in the matter of the housing schemes, showed business acumen and capital economy by refusing to run both electric cables and gas-mains to the housing estates, and decided upon gas-mains only in view of the larger range of utility that gas possesses for the purposes of the tenants of such houses. But the same Council who showed such wisdom retains in the hands of the Water Department the work of gas main and service laying. Probably this is something that has been passed on from times remote; but it is not good policy. The whole of the gas main and service laying work should be executed by the department responsible for the safe and proper transmission of gas. Another irregular and to our mind imprudent thing, particularly in these days, is that the meter reading is under the control of the Borough Accountant—on the ground, the President believes, that slot-meter inspectors collecting money should be directly responsible to this official. The reason is weak. Stronger reasons why properly gas-qualified men should look after the work of meter reading and prepayment collection can be advanced, and especially now that the change is about to be made to the sale of thermal energy in place of the sale of gas by volume. The experience of all well-organized gas undertakings is that considerable assistance and satisfaction can be given—through advice, small services, and ability to answer questions—to the consumers by the members of the staff who come into contact with them, and that the men who have some knowledge of gas use, and can explain current changes, are on the district an asset to a gas undertaking. Many gas undertakings are to-day giving special attention to the training of their men who come into touch with the consumers particularly with this in view; and we hope that Chesterfield will not much longer be occupying an isolated place in policy and practice in this regard. It is not, we feel sure, in the best interests of the gas undertaking.

Many other matters were dealt with in the address; but we must leave them, with the remark that, as indicated in the opening lines of this article, interest was not confined to one part, but was spread over all.

Neutralizing and Drying Sulphate of Ammonia.

PROGRESSIVE sulphate of ammonia makers are all considering the question of neutralizing and drying their product, and so giving to it a preferential demand in the market over that which contains free acid and an excess of moisture, both of which are bad in respect of transport, and are abominations in the eyes of users, whose satisfaction has to be cultivated in these days of expanding fertilizer competition from different sources. There are some progressive makers representing quite a respectable percentage of the British make of sulphate who have got well beyond the stage of consideration; and neutralization and drying are now part of their normal practices, and consequently their product has primary place. The processes of neutralizing and drying have had much investigation; and various means have been evolved for doing the work, several of which are commendable. We think it may be claimed that the gas industry has given a good lead in this direction. At any rate, so far we have seen nothing better evolved by coke-oven practitioners. Welcome, however, is any work that is done in this direction. Experiments with new methods and agents may produce results which may be an improvement economically or qualitatively. No one can tell until the trials are made. But whatever the results, the lessons are valuable in that, if the issue is inferior, the time of other men may be saved in making research on similar lines; if an improvement, then there is general gain.

In other columns Mr. T. Johnson, B.Sc., describes work that has been done in connection with a direct-type sulphate of ammonia plant, which is attached to a battery of coke-ovens. Experiment was made by the author with finely divided alkali salts, which, coming into contact with the free acid in the sulphate in a damp state immediately after leaving the centrifugal drier, would bring about neutralization. Precipitated calcium carbonate was first tried; and, so far as neutralizing was concerned, it satisfied requirements. The drying was accomplished by employing hot gases from a gas-jet; but care had to be taken to remove this sufficiently from the sulphate to ensure that dissociation did not take place. A revolving tube was used for the purpose, with staggered angle-irons bolted on the tube internally. The average results were as follows: Ammonia, 25·4 p.ct.; moisture, 0·2 p.ct.; free acid, *nil*; calcium sulphate, 0·5 p.ct. The calcium sulphate, it is said, would not be harmful for agricultural purposes; but it has the tendency of forming lumps

in the sulphate, which would interfere with its use in the drills unless reduced. Soda ash was then tried, with equally good results; the difference in analysis being the substitution of sodium sulphate for calcium sulphate. The soda ash, too, costs only about half that of precipitated calcium carbonate; but the bulk required for a given amount of sulphate is greater. There appears to be nothing in the process to induce the gas industry to depart from the use of ammonia solution or vapour for the neutralizing process. Many coke-oven managers have also a preference for ammonia gases; and they are after a process that will accomplish the neutralizing, drying, and grinding in one apparatus. Thus Mr. Johnson has not succeeded in satisfying those who desire this; inasmuch as the main features of his process are that neutralization takes place in an open vessel, and that drying is a separate operation carried out in another piece of apparatus and subsequent to neutralization.

Industrial Lighting Ideals.

A PAPER on "Industrial Lighting: Ideal Requirements, "Legislative and Otherwise," was read on Tuesday last week by Mr. L. Gaster at the meeting of the Illuminating Engineering Society. It is quite appropriate to talk about ideal requirements in respect of industrial lighting; but it seems, when all the practical considerations are marshalled for inspection, to border somewhat on the ridiculous to talk of legislative requirements. When regard is had to the bearing of light sufficiency, constancy, uniformity, reflection, prevention of glare, and other factors, on factory and man production, comfort, safety, and eye protection, it appears strange that legislation should be required for this purpose any more than for compelling the introduction of high-efficiency machinery in place of that which is less economical. Safety and eye protection are really the only grounds upon which legislation can be based to ensure adequate and proper lighting. It cannot possibly be founded upon any one of the other factors which contribute to the ideal in factory and workroom illumination being approached as nearly as possible. Adequate illumination carried out on scientific principles being of such economic importance, should alone be a sufficient inducement to the factory owner to see that this part of his equipment is of a character satisfactory in all respects. It is, however, clear from the paper and the succeeding discussion that there cannot be legislation in respect of factory lighting other than in very general terms, and that it will have to be left to the good sense of factory owners to realize the ideal as nearly as conditions will allow. But the realization of the ideal is going to be a complex matter under the vast variation of circumstances. Every industry is different from all others in its requirements. One process in a factory, even one material, varies from all others in the quantity of illumination a worker may require upon it. The amount of illumination that one worker needs will not be sufficient for another; what is sufficient for one worker will be excessive for another. So we go on; and complexity of conditions defies general specification or prescription. This was all seen from what Mr. Gaster and those who took part in the discussion had to say. Each industry must be taken by itself, be explored as to its lighting needs, and illumination requirements for the different processes be assigned. But what about the different eyes of the workers? Some compromise will have to be effected; and here the ophthalmic experts must come in, though one of them at the meeting confessed that, while eyesight was their field, they had made little study of the question of light quantity and (we might add) quality. It seems to us that these gentlemen will find it best to prescribe for variations of industrial light requirement a source of local lighting that is, without change, adjustable to work and the eyesight of the worker. They will find the gas-tap a wonderful assistant to this end.

Laboratories and Gas Tests and Training.

The Manchester Institution of Gas Engineers have in hand a piece of work which they do not wish to interfere with that of the industry at the Leeds University. A Committee is looking into the question of formulating a scheme for utilizing existing chemical laboratories in their area for staff training, chemical testing, tabulation of experimental results, and certification of these by competent and independent authorities. This might ultimately result in the setting-up of a well-equipped gas-works laboratory for carrying out tests required by gas undertakings and for the instruction of staffs in testing work, with payment by fees based upon an economic scale. Nothing definite has yet been done. The matter is at present being investigated.

Management in Engineering Works.

Abortive were the meetings that took place last week between the employers in the engineering trade and the Amalgamated Engineering Union in connection with the notice for a lock-out on March 11; but it is sincerely hoped that the parties will be able this week to do something to avert the threatened catastrophe. At the same time, the employers cannot be expected to give way over the question of interference by the representatives of the men in managerial control; nor can they, in the proper conduct of their works, concede the right of the men to refuse overtime or night work if conditions necessitate it.

Gas Coal Position.

There appear to be two factors controlling the gas coal situation at the present time. One is the reported large booking of orders for export, and the other the very general purchasing of the best grades of coal as a matter of good policy in view of transport rates. The result of these combined influences is that, in the gas coal exporting areas particularly, prices remain firm; and there is no present indication of further recession. A result of this is that from most of the coal areas there come reports of gas undertakings again buying from hand to mouth; and this they are able to do with the strain of the winter months lightening. The season for entering into contracts is approaching; but many gas managers, we know, hold the view that the prices of gas coal have not receded to the levels they should have done. It looks as though, with prices where they are, the policy with many undertakings will be short-term contracts supplemented by buying in the open market.

Rates and Taxes.

These are a necessary evil. No one likes them; but we all have to put up with them. We know well enough that Government—national and local—cannot be carried on without money, so that something must be paid in the way of rates and taxes. But what causes resentment is any extravagance that results in an inflation of the sum to be paid; and another point of irritation is that assessment committees and their officials apply such a variation of procedure to their work, with naturally disuniform results. The President of the Manchester Institution (Mr. Harold Davies), in the address published this week, is righteously concerned over this matter; and he hopes that what he says will arouse sufficient interest to develop into action the controlling heads of gas undertakings with the co-operation of the National Gas Council. He comments upon the very heavy burden imposed upon gas undertakings in the shape of rates and taxes, and asserts that the incidence of taxation was never more open to criticism than now. He finds an amazing variation in the per 1000 c.ft. amounts required for rates and taxes. Whether this is due to the combination of the two items he cannot say; and so he makes a suggestion to the compilers of returns—that in future the rateable values and the rates paid might with great advantage be separately ascertained and included in the published tables. The information, he thinks—and no doubt truly—would be of great advantage when the time arrives for the gas industry to push forward profitably a scheme for the more equitable assessment of its undertakings. But would all gas undertakings be prepared to supply their rateable values?

Domestic Gas and Carbon Monoxide.

The "Manchester Guardian" has been opening its columns to articles, by a "Special Correspondent," on "The Danger from Domestic Gas." The validity of the term "Special" can only be traced in the ability to give an exaggerated complexion to the presence in town gas of carbon monoxide—a constituent which has never been absent from town gas in some degree. The writer asserts that the quality of gas is getting worse and worse, and more important still it is becoming more poisonous and dangerous. What does he mean by "getting worse and worse?" Are the gas undertakings not keeping up to their statutory obligations in respect of calorific value per cubic foot, or what is

happening? He does not explain. Probably he thinks that the admixture of water gas is making the supply "worse and worse." Purchasing heat units, the concentration per cubic foot within any of the limits to which gas undertakings are working makes no difference to the consumer or to the efficiency in use. The addition of water gas, on the contrary, improves flame temperature, which is an advantage in all high-temperature operations. The "Special Correspondent" is intensely vague and unscientific. The gas is becoming more and more poisonous. Where? Generally speaking, to-day the proportions of water gas to coal gas are as they were prior to the war. The "Special Correspondent" says there is to-day some 15 to 18 p.ct. of carbon monoxide present in town gas, as compared with 6 p.ct. in the days of straight coal gas. The statement shows that the carbon monoxide is below the 20 p.ct. limit that Prof. Bone and Dr. Haldane suggested, and which the recent Departmental Committee considered in the light of experience to be unnecessary.

Rubbish in Writing and in Gas-Fittings.

The foolishness of the article becomes heaped up when the writer states that the most serious aspect of a high percentage of carbon monoxide in gas is the fact that the present gas-fittings in about 8 million houses were never meant for poisonous gas. Coal gas has always contained carbon monoxide; and gas has always been explosive when mixed with the necessary proportion of air. Yet this "Special Correspondent" says in the old days leaking gas-fittings were of little importance! We cannot understand the "Manchester Guardian" permitting the publication of such rubbish. When it is learned from the President of the National Gas Council that the accidental deaths from gas average per annum only two per million of the population, this is good testimony to set against the wild generalities of the "Special Correspondent." There would probably be an absolutely clean sheet in respect of fatalities if householders would purchase all their fittings through gas undertakings, and only have those the latter recommend and instal. This "Special Correspondent," of whose standing we are quite ignorant other than by deduction from his writing, recommends a limit of 12 to 15 p.ct. of carbon monoxide. Prof. Bone and Dr. Haldane, who are highly placed scientists, if a bit out of touch with the daily practical work of the gas industry, suggested (as said in the previous paragraph) 20 p.ct. The recent Departmental Committee found no reason to impose a limit, having regard to practical considerations and the lessons of experience. The 12 to 15 p.ct. suggested by the "Special Correspondent" compares with the 15 to 18 p.ct. that he says is the range of carbon monoxide content in the gas of to-day. Will he show how, under the conditions of use, his recommendation is so much better than the proportion of carbon monoxide that he acknowledges is the result of current practice? The carbon monoxide question has brought from their customary places some people with queer notions.

PERSONAL.

Owing to ill-health, Mr. J. W. Newbold, J.P., has resigned the position of Chairman of the Derby Gas Company, which he has held for the past six years. Mr. W. Woolley, who has been a Director for twenty years, has been elected Chairman. Mr. Newbold, who will retain his seat on the Board as Deputy-Chairman, has been a Director of the Company for 26 years.

Mr. Richard Crabtree, who has been Clerk to the Hebden Bridge and Mytholmroyd Gas Board for 27 years past, and by virtue of other public duties for 50 years is the senior public official of the area, has resigned.

OBITUARY.

We are sorry to learn of the death on the 2nd inst. of Mrs. Swallow, the wife of the Manager of the Elswick Gas-Works of the Newcastle-upon-Tyne and Gateshead Gas Company. Their golden wedding was referred to in the "Journal" for Oct. 19 last. Mrs. Swallow had been ill for a considerable time.

Midland Junior Gas Association.—The last contribution of the present session will be submitted to the Association at a meeting on Thursday of this week, March 9, in the Council House, Birmingham, when Mr. T. F. E. Rhead, M.Sc., Chief Chemist to the Birmingham Corporation Gas Department, will deliver a lecture entitled "Some Notes on the Chemistry and Physics of Gas-Works Refractories."

ELECTRICITY SUPPLY MEMORANDA.

Another Bill.

The Parliamentary Secretary of the Ministry of Transport (Mr. Arthur Neal) has put a little heart into that section of the electricity supply industry which wants to see the reorganization and concentration of electricity generation carried through, by Parliament conferring the necessary financial powers. The British Electrical Development Association recently had its annual luncheon; and Mr. Neal was present. He stated that Lord Peel would shortly introduce a further Electricity Supply Bill in the House of Lords. He indicated that the Bill would be designed to clothe Joint Electricity Authorities with the financial powers essential to their operation, and to deal with other matters upon which the industry desired legislation. The interesting information was added that the Bill would be non-controversial. To produce a Bill investing Joint Authorities with financial powers which will be non-controversial will be a worthy feat; for it is upon the question of financing these speculative undertakings that there has been so much difficulty. There seem to have been rumours that electrical legislation on a drastic scale is in contemplation; and a remark to this effect brought from Mr. Neal the information that no further legislation was contemplated by the Government, and that the industry had nothing to fear from parliamentary interference. Until the industry sees the terms of the proposed Bill, there will not be any great confidence that it will meet with its ideas; and before the opponents to the conferment of financial powers upon these incoherent and unstable bodies are satisfied, there will be a vast amount of discussion and probably contest. It is one thing to promise something after a luncheon; it is quite another thing to fulfil that promise when plans are introduced for decision in a House pledged to economy, and largely antagonistic to the wonderful reconstruction schemes of the Government, which have proved so expensive, and in no small measure futile. It will be noticed that the proposal is that the Bill shall be introduced in the House of Lords. That is where the financial provisions of No. 1 Bill came to grief. Probably the Ministry of Transport think that if they can get the measure through the Lords, they will be able to engineer the Commons right enough. That is open to question until an opportunity is given for considering the proposals.

[Since the foregoing was set in type, Viscount Peel has introduced into the House of Lords for second reading the Bill referred to. He says that, so far as the Electricity Commissioners are aware, there are no controversial clauses in the Bill. But the Marquis of Salisbury regards it as a "complicated" one; and, on his suggestion, the second reading was postponed in order to give their Lordships an adequate opportunity of considering the proposals.]

Wiring and Hiring Compromise.

The President of the Electrical Contractors' Association (Mr. J. Orringe) was recently a speaker at a little informal function, and made a statement which shows that the relations of the contractors to the municipal authorities owning electricity undertakings are of a more amicable order than they used to be. Time was when they were at daggers drawn over the subject of municipal trading in electric wiring and fittings. Many were the sharp contests in and out of Parliament; and the contractors were very successful in repressing the aspirations of municipal electricity undertakings in that particular direction. But latterly the bitter controversy has very largely died down; and little has been heard of any difference. This is largely due (so to speak) to a line of demarcation having been drawn, over which the municipal authorities do not, as a rule, trespass. The contractors, however, keep a very jealous eye on this. So Mr. Orringe was able to say that he believes a much better feeling prevails to-day. There is a willingness to work together; and there is evidence of co-operation. The President welcomes this improvement in relationship, and says it is the duty of contractors to show more and more a spirit of co-operation with municipal authorities. This is the correct attitude, so long as the one side has respect for the interests of the other, because naturally all who are interested in an industry—whether gas or electricity—prosper the greater the development of the fundamental factor, which in this instance is electricity consumption. But the members of the Contractors' Association desire that there shall be fairness. They saw in a proposal at Derby recently something that was unfair; and they very properly kicked against it. We have referred to this matter on a previous occasion. The story is this: Owing to the slump in industry, the Corporation Electricity Supply Department experienced a decrease in output. This resulted in one Labour member bringing forward a proposal that the Council should develop the electricity supply business by undertaking wiring at actual cost price. The Derby branch of the Electrical Contractors' Association opposed this piece of injustice—and successfully. Another thing that the President strongly advised was that the contractors should support the Electrical Development Association. It is obviously to their interests to do so, seeing that new business for them depends on new custom for electricity.

Salesmen and Responsibility.

The difficulties of the salesman of electricity and of electric fittings and appliances are numerous. Although in electric lighting, the men of the industry talk of a walk-over in respect of lighting, they know full well it is mere vain boasting. The fourth "Salesmanship" Conference, arranged by the Electrical Development Association, has been held. On this occasion electric lighting was the subject of discussion; and some of the difficulties of the salesmen in this connection were openly acknowledged. Mr. Haydn Harrison started the discussion; and he said plainly that those who had to deal with artificial lighting have great responsibilities on their shoulders. They have; but few in the electricity industry seem to realize it. There is the responsibility of proper information as to costs; and there is the responsibility of giving sound advice so that the eyesight of the users is not detrimentally affected. Responsibility for this matter is more than the electrical people care to acknowledge; the reason being that, in order to protect the eyes against the maleficent activity of the high intrinsic brilliancy lights (the higher intrinsic brilliancy gets, too, the greater the proportion of the ultra-violet rays), fittings have to be purchased for the purpose; and the use of these reduces light efficiency. Mr. Harrison made no secret of this. He mentioned that the modern gasfilled lamp has an intrinsic brilliancy of 5000 c.p. per square inch; and therefore with a 50-c.p. lamp $\frac{1}{100}$ sq. in. of light source was being supplied that is so brilliant that it becomes a source of annoyance. Higher efficiency in artificial light sources he said is nearly always obtained by shortening the wave length—that is, by bringing it nearer the violet end of the spectrum. Tingeing lamp bulbs with yellow or red simply means the reduction of efficiency. He advocates the use of opal globes, but not too large for the power of the lamps. He also warns against the employment of indirect or semi-indirect fittings, consisting of bowls of alabaster or even other materials, unless cost of electrical energy is of no importance. All this seems to us to limit considerably the scope of the salesman, save as to the exercise of his powers of persuasion.

Installation Costs.

Coming to other matters, here again there was as much to discourage as to encourage. It is now learned that electricity undertakings did not at one time do as much as they could have with electric lighting on account of the poor load factor; but now that the lighting has become a small proportion of the load (this depends on such local circumstances as to whether a district is residential or industrial), they are, according to Mr. Harrison, realizing that lighting at the present rate should be pushed in every way. That again depends on circumstances. Mr. Harrison suggests that, if supply authorities have the powers or the means, they would probably go in for free wiring and prepayment meters, as the gas companies have done. Are the conditions the same? The expense of provision, it is safe to assert, would not justify the rent that the householder would be prepared to pay above the ordinary cost of electricity, and the consumption of energy for lighting would be positively so low that it is doubtful whether the energy itself would be profitable. The idea of Mr. Harrison is that landlords should wire property, and thus make it more attractive. But, of course, that is not the whole of the story. The anything-but-original idea is accompanied by a suggestion as to increasing the rent. The householder would have something to say about that; and the landlords in these days would question whether the increased rent would not be rather a strong off-set to the "attraction." There is also advice to the salesman. He should know all about what he is selling, in order that the result may be satisfactory. That is very true. Salesmen want to be technically educated, so that they can advise as to the units of light required, equipment, and so forth, and particularly as to how to avoid injury to eyesight. Then Mr. Harrison suggests that something might be done in the way of a little camouflage on the £ s. d. question. Talk in small sums and small units seems to be the essence of his advice in this connection. This is what he actually said: "It is well to remember that £18 5s. per annum sounds much more than a shilling a day, and that it is better to talk about the average cost of an electric lamp per annum than the total cost of an installation. From curiosity, I looked up the last year's accounts at my house in the country, where I pay 8½d. per unit, and found that the cost per annum was 10s. per lamp installed." One speaker in the discussion indicated what is apparently a very general view—that until electricity could be installed more cheaply, there would not be much more progress. The same speaker also expressed the opinion that one thing electricians were up-against is that the public are realizing the effect of electric light on the eyes. They said that gas gave a pure white light which was the best for the eyes. But Mr. Harrison says there is no such a thing as a pure white gas light. The incandescent gas mantle, however, gives a spectrum very close to that of sunlight.

Price Policy.

In the editorial columns of the "Journal" last week, there was an article on "Price Policy." Price naturally plays an important part in the development of any industry. The electricians realize this—particularly in respect of domestic uses; for heat energy of the electrical brand is fearfully expensive, and the difference between it and other heat agents it is impossible to wipe-out by the attained efficiency of electric appliances. It is just as well, however, for the gas industry not to allow the public to get an idea that electricity is coming down in price at a faster rate than gas. Gas should endeavour to lead in this matter, and not follow electricity. Everywhere there is in the electricity industry recognition of the fact that the war and post-war prices of current have and are impeding development. Strenuous efforts are therefore being made to reduce the price additions that were placed on electrical energy. As we have shown from time to time, electricity undertakings are doing this, and some of them quite considerably. Several fresh instances are before us. Notably, there is the Liverpool Electricity Department, which has made reductions that will benefit the electricity consumers by no less than £227,000 a year. The consumers at Darlington are going to benefit to the tune of £6000. A halfpenny per unit drop there will make the charge the low one of 3½d., which was the pre-war figure. But for power the percentage excess over the pre-war figures is to be reduced by 12½ p.ct., which will leave 12½ p.ct. still to come off. This reminds us we were recently speaking of various undertakings lowering the percentage addition on lighting supply at a faster rate than on power supply. We see that this does not apply at Poplar. There the present charges are 85 p.ct. above pre-war rates for power and public lighting, and 70 p.ct. for private and domestic supply. These percentages are to be reduced at the end of March to a uniform charge of 50 p.ct. above pre-war rates; so that in this instance 35 p.ct. comes off power, and 20 p.ct. in the case of the other branches of business. The reason for this is that the price of power was advanced to a greater degree than lighting during the war. It is also observed that the Electricity Committee have approved a letter which it is proposed to send to the consumers, pointing out "the difficulties under which the supply has been maintained, having regard especially to the coal disputes, involving importation of foreign coal at enormous cost, and a consequent deficiency in the accounts which has to be met, and that the charges have not been raised, as in the case of gas, to meet this loss." It is hoped that the new plant will, with the lower cost of fuel, provide compensation.

Power Companies and General Supply.

The National Gas Council recently called attention to the tendency of power companies to seek to obtain general supply rights, which is altogether opposed to the original principles applying to such concerns. The North Metropolitan Electric Power Supply Company have lodged in Parliament a Bill which, among other proposals, seeks to have vested in them the undertakings of the North Metropolian Electrical Power Distribution Company, Ltd. In this case, however, the energy distributed by the latter is purchased in bulk from the Power Company, who are really the owners of all the share and loan capital. The separation between the two is not therefore distinguished by any great amount of individuality. The London County Council are going to oppose the Bill, for one thing because a clause in it will enable the Company to give not only a bulk supply, but also a general supply without being subjected to the usual safeguards and obligations. The exercise of such a power would, it is asserted, be detrimental to existing undertakings in the Administrative County of London, some of which are subject to powers of purchase now vested in the Council. Having regard also to the proposal to establish in the near future a Joint Electricity Authority for the London and Home Counties Electricity District, the County Council are strongly of opinion that there is no justification for the grant of such powers at the present time. So the North Metropolitan Bill is to be opposed.

London and Southern District Junior Gas Association.—There is to be a visit next Saturday afternoon, March 11, to the Old Kent Road Works of the South Metropolitan Gas Company. At the next business meeting, on Friday evening, March 31, in the Westminster Technical Institute, Mr. J. S. Thorman (Engineer of the Bow Common Works of the Gas Light and Coke Company) will deliver an address entitled "Some Carbonizing Notes." The date of the ninth annual dinner and concert is Saturday, April 1, at Anderton's Hotel, Fleet Street.

Gas in a Dairy.—The installation of a 3 H.P. gas-fired steam-boiler by the Industrial Fuel Department of the Consumers' Gas Company of Toronto at a local dairy forms the subject of an illustrated article in the "Intercolonial Gas Journal of Canada." Each day the boiler is started up at 11 a.m.; and as soon as the gauge shows a pressure of 10 lbs., the steam is turned on to the pasteurizer. After this sterilizing is completed, the boiler is continued in operation until the gauge shows a pressure of 75 lbs., at which point the milk is put into the pasteurizer, holding approximately 64 gallons, and the agitator is started. The steam raises the temperature of the milk in 45 minutes to 143° Fahr. While the milk is being pasteurized, steam is also used to heat water for washing bottles; and when the pasteurizing of the milk is completed, the gas is turned off—the gauge showing at this time about 30 lbs. The steam left in the boiler is then used to sterilize the bottling machine and milk cans; and the hot water remaining is used for general cleaning-up purposes. Gas is consumed for approximately two hours daily, at a cost of 37½ cents per hour. The transformation from wood and coal fuel to gas alone shows a decided saving in favour of the gas; while the saving in time is also a large item. Steam is now available 35 minutes after starting-up.

THE IDEAL HOME EXHIBITION.

An Attractive Gas Display at Olympia.

OLYMPIA—the home of so many exhibitions—is once more the scene of the "Daily Mail" Ideal Home Exhibition, which opened last Wednesday, and is to last until the 25th inst. It is a good show from all points of view; and there are many features upon which one would like to dwell, for matters connected with the home make an appeal to everyone. Among the many lovely things to be seen, one would give early place to the large annex which contains a magnificent collection of ornate gardens designed by the Queens of Holland, Spain, Belgium, Norway, and Roumania, Queen Alexandra, Princess Mary, Princess Alice, Lady Patricia Ramsay, and four children of the Royal House. Here and elsewhere, the varied display embraces a big working demonstration of newest devices and inventions for houses and gardens of all sizes. Temptation to wander must, however, be resisted; and in these pages reference must be confined to the very substantial part taken by gas in the exhibition. This, indeed, is an aspect of which it is a pleasure to write; for gas, which plays an indispensable part in the modern labour-saving home, is (as should therefore be the case) worthily represented, in its uses for lighting, cooking, heating, and hot water.

The London Gas Exhibit.

In our notice of the stands which, from a professional point of view, interest "JOURNAL" readers, first place may properly be given to the first-rate exhibit that has been prepared by co-operation of the eight big London Gas Companies—the Gas Light and Coke, South Metropolitan, Commercial, South Suburban, Brentford, Wandsworth, Wimbledon, and Epsom, Tottenham, and Croydon. Representatives of the eight Companies are manning the stand; and each wears a neat little badge bearing the name of the Company to which he belongs. It is felt that visitors from any of the different areas can feel no diffidence in seeking enlightenment, when they see that they can secure it from a representative of their own particular Company. A staff of women has also been provided by the different undertakings, for demonstrations in ironing and to deal with points about cooking.

Now as to the stand itself. It is really unnecessary to say that the design and arrangement are fully worthy of the importance of the contents. A beautiful lighting and colour scheme (contributed by many handsome silk shades and floral decorations), combined with plenty of elbow room and a general air of comfort, invite the passer-by to pause and enter. There is nothing closed-in about it; and from almost all points a complete view can be had. The illumination, of course, is a feature. The lighting in the passage way is "Metro;" while one of the two sections of the stand represents Sugg's lighting, and the other is divided between "Nico," "Bland," "Brentford," and "Emperor" burners. The semi-indirect lighting (with artistic bowls), carried out by means of "Metro" pre-heated cluster burners, is quite a feature of the exhibit. In addition the Companies have arranged the lighting at four of the other stands, at the request of the holders; and for this purpose different schemes were devised, providing examples of decorative, semi-indirect, and utility lighting. Some of the fittings are pneumatic switch controlled; while others are fitted with "Metro" pilot lights.

One of the main objects aimed at is to instruct the general public in the change-over to the therm basis of charge for gas; and to accomplish this, a telling demonstration has been devised. For this, there is a small holder which is filled with air (as being more convenient than gas), under a pressure of 2 inches. In a line are five meters which are supposed to be in use in five different towns, supplying gas, respectively, at 450, 475, 500, 525, and 550 B.Th.U.; and in front of them are five slide-rules, which readily show the conversion of cubic feet into British thermal units. The volume of gas required to boil a certain quantity of water varies, of course, in each case with the calorific value of the gas; and it can be seen from the slide-rules that the number of British thermal units used being the same, the quantity charged for is identical in the five instances.

A fine selection of fires and cookers has been made for display in different parts of the period over which the exhibition is to run. The fires include the "Metro" No. 17 "Ruby," Richmond's "Louis XIV.," Davis's "Juliet," Fletcher-Russell's "Palermo," Main's "Thackeray," Cannon's "Rose," Wright's "Aero," Parkinson's "Conrad," "Metro" No. 50 with boiling-burner, Parkinson's "Ratcliffe," Main's "Sheridan," and Wilson's and Mathieson's "Sunbeam." Cookers are being represented by Richmond's "Bungalow," the "Brentford" standard cooker, Davis's "Croydon," the "Metro" Sugg's "Westminster" with Larkin hot-plate, and Parkinson's No. 6. In connection with the cookers are fitted Potterton's hot-water system and also fires, to meet the requirements of the all-gas kitchen. Supplying the bath are found a Ewart "Lightning" geyser and a hot-water supply from the Potterton installation; while for the lavatory basin there is a Ewart "Brilliant" heater. The "Metro" and the Davis low-pressure gas-irons are certain to prove a great attraction in the able hands of the demonstrators. Among other items noted were a Davis incinerator, and a Sugg wash-copper.

Anxious as are the attendants to explain everything fully to those who may call at the stand, even the passer-by may learn much to his advantage by simply heeding the cogent messages that are conveyed by pictures and brief written explanations. For instance, he can learn for himself how to read a meter; and he can see depicted some of the numberless uses of gas. A tinted map showing the areas of the eight Gas Companies associated with the exhibit, has beneath it: "5027 out of the total of 6236 doctors practising in the districts of the eight London gas undertakings illustrated above, use between them 15,686 gas-fires. Are gas-fires healthy? 80 p.ct. of the London doctors use them." Above the different fires are some excellent specimens of the photographer's work, depicting the use of gas in the home and for lighting churches, sports grounds, &c. In addition to all this, the lower portion of the extensive stand is surrounded by eight large tablets, each of which bears a message. In the following manner it is pointed out what a gas consumer can get for one-sixth of a therm.

> A simple meal for six persons, comprising meat, vegetables, and sweets, can be prepared in a gas-oven for a consumption of 1-6th therm.
>
> A room of average size can be lighted for twelve hours with bright, soft, well-diffused light for a consumption of 1-6th therm.
>
> Sufficient hot water for a bath can be obtained from a gas water-heater for a consumption of 1-6th therm.
>
> A room of average size can be made and kept comfortably warm for one hour for a consumption of 1-6th therm.

Radiation, Ltd.

Another well arranged and readily accessible stand is that on which the six firms comprising Radiation, Ltd., display a number of their well-known specialities. The firms and the goods they show are: Messrs. Arden Hill & Co.—No. 593 "Compact" cooker, 14-in. "Sovereign" fire, and wash-boiler. The Davis Gas Stove Company—No. 118 cooker, "Standen" fire, No. 1 "Sentry" boiler, and "Midget" and "Perfecta" geysers. Messrs. Fletcher, Russell, & Co.—combination range and fire, No. 14 "Desmond" fire, and horizontal water-heater. The Richmond Gas Stove and Meter Company—No. 3 "Bungalow" cooker, "Louis XIV." fire, "Ironclad" heater, and "Lyn" boiler. Messrs. Wilsons and Mathiesons—"Advance" cooker, "Sunbeam" fire in own interior, and "British" cast-iron geyser. Messrs. John Wright & Co.—No. 570 "Compact" cooker, 21-in. "Kenilworth" fire, and "B.T.U." builder's set.

The "Compact Eureka" cooker, it may be said, is obtainable in three sizes. The hot-plate is fitted with high efficiency burners; and a simple arrangement of the tap gives three distinct lengths or power of flame. Hook-on extensions to the hot-plate provide room for large vessels to be drawn away from the burners. A stand raises the cooker off the floor. The "Bungalow" series, made in five sizes, has a porcelain enamelled outer casing and linings without projecting screws, which make cleaning a simple matter. The ease with which the cooker takes apart is a special feature. The enlarged hot-plate gives plenty of room; and the "Efficiency" burners, with their special hot-bars, have given greatly increased economy. The "Advance" cooker has a raised oven; and the drip-tin slides like a drawer underneath. For varied cooking, the oven-space can be divided into three different heats, enabling dishes to be perfectly cooked with the right heat, and all at one time. The oven-casings are scientifically constructed to form a double air chamber, with a polished reflector fitted inside. The result of this unique combination is a quickly heated oven with a low consumption of gas. It is fitted with a large plate-rack and back-plate; and the towel-rail, matchstand with striker, taper-holder, &c., are convenient little devices which add much to the comfort of the user. The combined gas-cooker and fire has been evolved to take the place of a kitchen range in one unit. The fact that the oven may be internally or externally heated as desired is a feature that will be appreciated by those who prefer that there shall be no flames in the oven. For the initial quick heating of the oven, shutters are opened so that the flames of the burners are directed inside the oven. When the shutters are closed, by means of a lever in the base, the heat is directed round the oven, thus enclosing it in a jacket of heat. Ample space on the top makes boiling, &c., an easy operation; while the gas-fire with duplex tap will give ample heat after the day's work.

The gas-fires shown embody all that is best in modern practice; all parts being interchangeable and standardized. Visitors will find their attention attracted by the beautiful finishes and designs. The "Sunbeam" fire has stood the test for many years, bearing a striking resemblance to a glowing fire; and it can be fitted into any modern grate. The handsome "Kenilworth" fire shown is capable of heating a room 25 ft. square.

The wash-boilers are remarkable for their sturdy construction and good appearance. They are made in 8, 10, and 12 gallon sizes, with wooden or iron lids, and can be supplied with or without a draw-off tap. The geysers shown are made on a patented principle, which ensures the utmost rapidity of heating with a minimum consumption of gas. They are constructed on the "sealed" principle; and the complete interior can be removed *in situ*. The instantaneous heater of the horizontal type is particularly useful fixed over a lavatory basin or scullery sink. The "Lyn" boiler is a small storage boiler for a lavatory basin or a scullery sink, and is constructed on a fool-proof principle, having no ball valve to get out of order. Being fitted with a thermostat valve, the consumption of gas is reduced to a minimum directly the water reaches any pre-determined temperature. The "Sentry" boiler provides a more regular and abundant supply of hot water than the kitchen range boiler, at

about half the cost. It can be operated with coke, anthracite, or coal with equal efficiency. Installed in conjunction with a gas-cooker, the "Sentry" boiler permits of the kitchen range being entirely dispensed with. The "B.T.U." builder's set is made in four sizes, having capacities of 12, 20, 30, and 40 gallons; the consumption of gas when full-on being 40 c.ft. per hour for the two smaller sizes, and 80 c.ft. per hour for the two larger sizes. These consumptions are reduced to a minimum by a special metal rod thermostat valve immediately the water is hot enough for bath or domestic purposes. These sets are provided in two heights, making them suitable for any household. The "Ironclad" boiler is of specially sturdy construction; and having all vertical waterways, no deposit of lime can possibly affect the heating efficiency. The "W.R." pattern is made so that the water-ways can be exposed and the boiler cleaned out without disconnecting any of the water or gas connections.

"Nautilus" gas-fire flues have assisted greatly in reducing costs of building since the war. Where it is intended that gas-fires shall be used for heating rooms, these blocks can be built into the thickness of the wall, saving as much as £62 11s. in the cost of erection in a pair of cottages. Added to this, the unsightly chimney breast in any room is done away with, giving greater floor space and a bigger cubic content to the room.

Thomas Potterton.

On this stand a practical display of gas appliances for water heating is made, demonstrating by working examples the convenience and efficiency afforded by the well-known "Victor" gas-boilers, in conjunction with the respective components, forming complete installations for domestic hot-water supply and central heating. A selection of standardized types of "Victor" boilers is provided, together with an assortment of complete apparatus, having the boiler unit and circulating cylinder, with connecting pipes, assembled in portable form ready for the pipe-services. A new feature is to be found in the "Victor" boiler "H" Series Nos. 92 and 93, which series has only recently been introduced, and is shown fitted-up as a complete apparatus with rectangular storage vessel and connections. This provides a most compact apparatus, being 12 in. wide over-all, so that for small houses, or to occupy the kitchen chimney recess with the cooker, it is particularly useful.

The working section comprises the following installations: A complete unit with No. 92 "H" Series "Victor" boiler, applied with a jacketted cylinder of 28 gallons capacity to operate delivery of hot water to sink for culinary purposes. This demonstrates the ease and certainty of action of a properly designed installation; water at a suitable temperature being available at all times, without waste and with minimum labour. A second domestic supply unit, comprising a No. 19 "D" series boiler, with a 30-gallon cylinder, is fitted, providing hot water for a modern shower bath in constant action. An interesting example of central heating with circulating radiators, operated by a No. 72 boiler, demonstrates the reliability of gas-fired apparatus for offices, halls, staircases, and rooms where intermittent use or the absence of fuel storage creates difficulty.

Mr. Thomas Potterton now makes a special feature of rustless apparatus suitable for use with soft water as usually found in the Midlands and North of England; treated boiler castings with copper cylinders and pipe connections being available, of which a complete example is shown. Thermostats for the automatic regulation of gas consumption, both water-type and atmospheric type, can be seen in action. The new "Victor-Combination" boiler, using coke or other smokeless fuel as an alternative to gas, or conjointly, is exhibited for the first time. This is specially designed to meet a long-felt want in private houses where a kitchen range is not installed and solid fuel is required for continuous winter duty, including that of supplementing the general warmth by circulating radiators. The new "Victor" double boiler No. 220 is also being exhibited for the first time. It is intended for use in connection with radiator systems where a constant duty occurs, and the demand is greater than the standard single unit will operate. It will be interesting to see developments in connection with this innovation.

A distinctive feature of the stand is the lighting equipment, which has been carried out for the firm by the South Metropolitan Gas Company, with "Metro" burners and automatic switches. The greater portion of the illumination is obtained from the ceiling of the stand, upon the semi-indirect principle; and as the ceiling is constructed of muslin, the excellent result affords high testimony to the character of the installation.

A new catalogue in condensed form is provided for distribution at Olympia, which states in a clear manner the capacities of the various boilers and accessories, and includes a supplement giving useful practical information upon the erection of gas-heated hot-water supply apparatus.

Some of the Other Exhibits.

Messrs. Sidney Flavel and Co., Ltd., of Leamington, exhibit their "Imperial" fires, in different styles and finishes; "Imperial" radiators, heated by steam, with gas for fuel; and a quick-acting inexpensive geyser. There is also a three-size series of neatly designed gas mantel register grates, suitable for use in connection with housing schemes. Another feature here is the "Utility" gas hot-plate, which is fitted with a ring-burner placed at the correct distance from the surface of the plate. Above the burner a loose cover fits into the top of the hot-plate. When a vessel is to be boiled, the loose cover is removed, as in the usual kitchen range, and the gas-flames are allowed to come in direct contact with the pot or kettle. After the boiling-point is reached, the vessel may be moved to another part of the hot-plate, where it will keep boiling, while another vessel takes its place over the gas-ring. To keep a number of vessels hot simultaneously, it is necessary to replace the cover over the gas-ring, and let the flames spread over the entire under-surface of the plate.

The Stimex Gas-Stove Company, of Balham, display their cookers, fitted with closed oven and exterior burner-chambers, and their combination range—cooker, fire, and hot-water system. They have also circulators provided with thermostatic control—the "Stimex" patent gas economizer.

A number of geysers of different sizes and patterns, some of them in action, are to be seen on the stand of Messrs. Ewart and Son, Ltd., Euston Road, who also exhibit their new "Boilo" gas-heated washing copper. One feature of the "Boilo" is a spun-copper pan, in one piece, without seams or joints. It is claimed to combine maximum strength with minimum weight. All parts are detachable, and can be replaced without skilled labour.

The Lawson odourless heater is to be seen; and quite a number of firms, other than those already mentioned, draw attention to geysers and gas-cooking devices for use in connection with a gas-ring and flexible tube. The London Mica and General Supply Company, Ltd., exhibit the "Discon" miniature incandescent gas light; and Messrs. James Stott and Co., their well-known governor, and various water-heating appliances. The Hot-Plate Hardware Company, Ltd., have a hot-plate kettle, in which, by the simple expedient of providing a space above the body of the kettle, plates can be warmed, food kept hot, and other uses can be adapted, without the further expenditure of gas than is already in use under the kettle in which water is being boiled.

Messrs. Major and Co., of Hull, are demonstrating the advantages of "Solignum" as a decorative stain, and pointing out its excellent preservative qualities.

On the stand of Winget, Ltd., among other novel features, is demonstrated the much-discussed system of concrete block construction, by means of which some of the most striking houses are now being built in the "Daily Mail" model village at Welwyn Garden City, Herts. Besides working examples of various concrete block, brick, and tile making machines, the stand includes both crushers and crushing rolls. "Winget" concrete tiles can be coloured to any tone desired.

IDEAL HOMES EXHIBITION IN EDINBURGH.

Fine Display by the Corporation Gas Department.

An Ideal Homes Exhibition in which the manifold uses of gas in the service of the household did not receive prominence would lack a most important feature. For while exhibitions must be attractive and, if possible, picturesque, the public would soon grow tired of them if they were merely spectacular and not practical and educative. The Ideal Homes Exhibition in the Waverley Market, Edinburgh (which concluded on Saturday, after a most successful fortnight), comprised among its numerous exhibits relating to the home an excellent and imposing display by the Edinburgh Corporation Gas Department. Among many appealing exhibits it had no difficulty in arresting the attention of visitors. The brilliancy of the lighting effects was an object lesson to those who are inclined to think meanly of gas as an illuminant; while the imposing array of cookers and heating appliances served to bring home the fact that gas is one of the best and most economical domestic "helps." Everything on the stand, in fact, was intended to emphasize the superiority of gas as a lighting, cooking, and heating agent. Around the stand were hung neat little placards extolling in terse phrase the virtues of gas, such as: Gas is Hygienic; Gas is Reliable; Gas Saves Time; Gas Saves Money; Gas is Healthy; Gas is Efficient; Gas Saves Labour; and Gas Means Comfort. Among other apt phrases were: Wash with Gas; Cook with Gas; and Iron with Gas.

What was even more important was that those in charge of the exhibits were always eager and willing to demonstrate the labour-saving and economical properties of the various appliances. Cooking demonstrations were given daily at the adjoining stand, in conjunction with the Edinburgh School of Cookery; and the large number of people—particularly the women folk—who crowded round to watch the fair cooks showed how great was the interest taken, not only in the actual preparation of the various menus, but in the effectiveness and cheapness of gas as a cooking agent. This was certainly one of the most attractive features of the exhibition. Demonstrations were given daily of how to cook a four-course dinner with a quantity of gas costing only from 1d. to 1½d. All the dishes and utensils were washed at the stand with hot water from a gas-heated boiler with overhead tank. Demonstrations of laundry work, washing, and ironing were also given.

Gas-fittings to suit all requirements were shown. These were of various artistic designs and finish, and in colouring to harmonize with any type of decoration. Pendants with different coloured shades and bead shades in handsome designs were also in evidence, as well as fittings for indirect and semi-indirect lighting. Something quite up-to-date were the newel-post lights,

with opalescent bowls and superheated burners. Gas-cookers of every design and capacity, to perform any culinary requirement, made an imposing show. The more elaborate makes and the less expensive, and also those which are supplied by the Corporation on free loan, all found a place on the stand. There was the "Edinburgh" cooker, which is supplied on free loan, and the more costly models which were for sale outright or could become the property of the user by hire purchase. Plate racks for attaching to the cookers, and trays were also shown. There were numerous types of boiling-rings, grillers, hot-plates on view under working conditions. Gas-ranges, complete with hot-water circulators and fires, instantaneous hot-water heaters, hot-water showers and geysers (several of which can be dismantled for cleaning and afterwards re-assembled without technical knowledge) attracted a good deal of attention. Much admired were the various types of combination ranges, which included cooker, hot-plate, gas-fire, and water-heater. These are suitable for all kinds of houses, and are entirely superseding the old-fashioned kitchen range.

Gas-fires were numerous. They were shown in several finishes, from plain black enamel to highly-finished armour bright bronzed, or any shade of enamel. Placed in suitable mantels with tiles to match, they made a most effective display, and proved a great attraction. Interest in this portion of the exhibit was enhanced by the fact that these fires are made in designs to suit any period of architecture—Georgian, Adam, &c. There was also a fine display of radiators for halls, shops, and picture houses.

Hot-water appliances included circulators combined with storage tanks, and all the different kinds of geysers, finished in copper or silver, and provided with safety interlocking taps, and, if required, a connection for a hot shower.

Many varieties of gas-irons were shown. One most interesting device was a meter which could be attached to any of the numerous appliances. It showed at a glance the amount of gas used per minute or per hour, and, at the same time, gave the cost of the gas consumed at the current rate. Heating stoves for using coke were also shown. An attractive form of advertising was the four-sided revolving pictorial sign illuminated with gas flash light. Each picture told a story—in other words, depicted the various uses to which gas can be put—lighting, heating, cooking, hot-water supply.

Round the stand were hung both low and high pressure lamps suitable for outside lighting; while the display of table lamps with artistic shades, and old-fashioned lanterns, lighted with gas, added their quota to the completeness of the exhibit. One of the geysers, it may be mentioned, was connected-up with an enamelled bath, and the hot water was seen running into it. The rents of all gas-fires were reduced as a special attraction during the exhibition.

Although the stand itself was sufficiently picturesque to command attention, the fact that the price of gas has recently been reduced in Edinburgh by 8d. per 1000 c.ft., under the ægis of the new Engineer (Mr. Gracie), gave the public an added interest in gas as a household servant. As 1d. per 1000 c.ft. represents in Edinburgh nearly £10,000 per annum, the reduction means a saving to the citizens of the capital of £80,000. Another reduction is spoken of as a result of further economies and the introduction of more scientific control. Apart from this, however, Mr. Gracie and the Gas Department may be heartily congratulated on bringing before the public in such a convincing and picturesque manner the fact that gas is a *sine qua non* for the ideal home.

Other Exhibits.

In addition to the comprehensive display made by the Edinburgh Corporation Gas Department, some well-known manufacturing firms had prominent stands. Among these may be mentioned the Forth and Clyde and Sunnyside Iron Company, Ltd., Falkirk, who had an attractive exhibit of cooking and heating appliances for gas and coal, as well as a fine display of baths and iron castings for the building trades. The Parkinson Stove Company, Ltd., of Glasgow, Birmingham, and London, showed a fine range of cooking and heating appliances, including the latest gas-fire developments of convected and radiant heat—the "Conrad" gas-fire. The Parkinson-Maughan geysers and water heaters and circulators were also on view. An excellent display of gas cookers, fires, steam radiators and water circulators was prominent on the stand of Messrs. R. & A. Main, Ltd., of the Gothic Iron Works, Falkirk. Evidence of the advance in gas economy and effectiveness was illustrated at the stand of Radiation, Ltd. Their exhibits included gas-grates, and a wide range of gas-cookers. Prepayment and ordinary meters, in tin-plate and cast-iron cases, were shown in action by Messrs. Alder and Mackay, Ltd., of Edinburgh. Among the exhibits of Messrs. Parkinson and W. & B. Cowan, Ltd., Edinburgh, &c., were meters of various types, a model station governor and bye-pass, street lanterns, arc lamps, hanging pendants with burners, and incandescent burners. Gas-fittings of various kinds were displayed by Messrs. J. & W. B. Smith, Ltd., of London and Glasgow.

THE EDINBURGH CORPORATION GAS DEPARTMENT STAND.

Manchester and District Junior Gas Association.—A successful meeting of the Association was held last Saturday at Guide Bridge, when a visit was paid to the works of General Gas Appliances, Ltd., and a paper on "Card System Records in the Distribution Department" was contributed by Mr. D. T. Livesey, of Stretford. Our report of the proceedings is unavoidably held over until next week.

BRITISH INDUSTRIES FAIR AT THE WHITE CITY.

THE regulations restricting the trades which may exhibit at the British Industries Fair at Shepherd's Bush, from Feb. 27 to March 10, preclude the gas industry from taking a large part in that hive of hopeful energy. It is satisfactory, however, to record a general atmosphere of anticipation and "a certain liveliness" among buyers and sellers. "Chemicals, light and heavy," "Dyes," and "Glassware of all descriptions" are the only departments that concern our industry—in fact, the only direct testimony of its existence is the many "batteries" of four gas-fires which render the buildings habitable.

However, the first stand that claims the eye inside the Uxbridge Road entrance harbours an array by the South Metropolitan Gas Company of their coal-tar and ammonia products and dye intermediates; the entrance being guarded by a model lighthouse of "Metro" pitch washed by a sea of sulphate. The fine quality of the sulphate is admirably demonstrated by large hour-glasses bearing the superscription "'Metro' Sulphate Crystals. See how they run." They also have some sample bags of sulphate which has been kept under ordinary conditions for twelve months, and retains the first-rate qualities of the product. Close-by, the Gas Light and Coke Company's Chemical Works have a show-case of tar and cyanogen products. Messrs. Burt, Boulton, and Haywood, Ltd. (of Salisbury House, London Wall), have managed to include the maximum of interest in a small stand. In addition to the usual range of tar products and some proprietary brands, they show a complete model of a creosoting plant and one of a continuous tar-distillation plant, about both of which they are prepared to receive inquiries. Over the stand is hung a section of timber fence, cut from the Victoria Docks on Feb. 21, 1922, which was creosoted and erected by the firm in 1854. The remarkable preservation of this can be explained by an examination of smaller samples showing the deep penetration of the creosote and the consequent sterilization of the wood. A gold fish placidly swimming in a tiny bowl roused the writer's curiosity, till it was pointed out that the bowl contained a quantity of "Burtumen," a new "non-polluting" road dressing prepared at their Silvertown works. This is of special interest in view of recent discussions and litigation concerning river pollution and damage to crops by the washings from tarred roads. Messrs. Charles Page & Co., Ltd., of Nos. 47-51, King William Street, exhibit their coal-tar intermediates and naphthalene-ring colours.

In the glassware section, the sole interest for the gas industry is the display of The Thermal Syndicate, Ltd., of No. 28, Victoria Street, who show their "Vitreosil" specialities, striking among which are their semi-indirect lighting bowls. Tastefully arranged as these can be, with chain or pneumatic control, they should become widely popular. It was disappointing to find no other lighting exhibits to relieve the display of household ware and optical requisites.

Oil-Gas Manufacture at San Diego.

The San Diego Consolidated Gas and Electric Company have established a monthly magazine, in the latest issue of which we find an outline of the local methods employed for the manufacture of oil gas. The Company make both oil gas and water gas; the water gas being obtained through utilizing oil-gas bye-products, and being therefore relatively a side issue. For making the oil gas, there is employed what is termed a "straight-shot" type generator—a cylindrical steel shell 20 ft. in diameter by 30 ft. in height, containing firebrick checkerwork. This checkerwork is first brought to a high heat (about 2200° Fahr.) by means of oil-flames which are directed on the brick through four burners at the bottom of the generator. Steam is introduced with the oil, in order to atomize it and effect proper combustion; and an air blast is also maintained. This firing period, with the stack-valve open, is of about twelve minutes' duration. Then the firing is discontinued, the stack-valve closed, and fuel oil injected (with steam) through five atomizers in the top of the shell, and precipitated upon the hot brick. The make also lasts for about twelve minutes, during which time gas is continually generated and drawn off through an outlet at the bottom of the generator. The oil which is thus used is first passed through a tubular steam heater, which raises its temperature to about 200° Fahr. The rated productive capacity of the generator is 1,350,000 c.ft. per day. Each of the three purifiers contains an upper and lower section partly filled with a "sponge" of pine shavings, lime, copperas, and rusted iron borings. For the whole of 1921, the average quantity of oil used by the Company per 1000 c.ft. of gas produced was 7·24 gallons. The Company have now under construction a generator of the Oil-Gas Process Company's two-shell improved type, the efficiency of which is higher than that of the regular straight shot, but in which the fundamental principle of generation is practically the same. This new generator will be of a capacity of 5,000,000 c.ft. per day.

The Civil Aviation Advisory Board has now been set-up to advise generally on the development of civil aviation, and to report upon any specific point which may, from time to time, be referred to them. The Federation of British Industries are represented on the Board by Mr. H. James Yates.

BRITISH INDUSTRIES FAIR (BIRMINGHAM SECTION).

The Birmingham Section of the British Industries Fair at the Castle Bromwich Aerodrome was fairly well attended last week by overseas buyers and representatives of London export merchant houses. The Lord Mayor (Alderman D. Davis), who is the President of the Birmingham Section, visited the Fair on the opening day, and at a luncheon he emphasized its great value from an Imperial point of view; while Mr. Neville Chamberlain, M.P., referred to a rumour that efforts had been made in semi-official quarters to secure the removal of the Birmingham Fair to London. In his opinion, it was of the highest importance that the products of Midland industries should be displayed in Birmingham. He added that, if need be, Birmingham and other members of Parliament would use what influence they possessed to prevent the removal of the Fair.

On Thursday, the members of the Fair Council visited the White City, and were presented to the King and Queen.

GAS EQUIPMENT.

The display of gas equipment is smaller than last year; but much of it is extremely interesting. Two "Tilley" gas-compressors, each of 1000 c.ft. per hour capacity, are shown. They are used for raising the pressure of the gas for supplying the 43 overhead high-pressure lamps for the general lighting of Building A. Each compressor is run alternately. The gas is raised in pressure from 2 in. to 60 in. water column.

GAS-HEATED FURNACES.

The activities of the City of Birmingham Gas Department Industrial Research Laboratories are well demonstrated at a stand near the main entrance, where a number of different types of up-to-date gas heating apparatus and special testing machines are on view. Among these are included a special gas-sealed furnace, in which special forms of tools and components, such as are used in the motor car and allied trades, can be heat-treated with absolute freedom from scale. This type of furnace is now being used extensively in different parts of the country for general heat-treatment processes where scaling of the work is to be avoided, particular examples being the needle, fish hook, and pen trades, and a large number of trades connected with the motor and motor-cycle industries. A larger type of this furnace is also exhibited in another part of the Fair by Messrs. Gibbons Bros., Ltd. (Dudley), in Block "B;" this firm manufacturing furnaces of this class fired by gas and solid fuel. They also show gas retorts and furnace regenerators.

Other exhibits on the Corporation stand include a number of small furnaces of modern design suitable for enamelling, rivet heating, tin-plate trades; also one or two different types of gas-heated annealing furnaces suitable for either ferrous or non-ferrous work. Among the various testing appliances are shown the latest form of spring testing machines, wire testing machines, and also a reverse type of torsion testing machine. Facilities are offered by the Department for tests to be carried out at the Fair by special arrangement.

SCIENCE AND INDUSTRY.

The necessity of the application of science to industry has perhaps made itself more felt at the present time than ever, owing to the keen competition from overseas; and visitors who are interested in this work are advised to make an appointment with the representative in charge of the City of Birmingham Gas Department stand, who will make arrangements for visits to be paid to the various laboratories, heat-treatment shops, and special showrooms, where furnaces of every type have been installed for demonstration purposes. The Birmingham Gas Committee realized as early as 1911 the necessity of catering for the requirements of the various manufacturers of the city in regard to all types of gas-heated plant; and during the last five years, the department has gradually extended its activities. Now it is possible for almost every manufacturing trade of the city to obtain most up-to-date gas-heated appliances and furnaces for any particular work required from the department. The laboratories are also available for Birmingham manufacturers to carry out any special forms of testing, and also special investigations necessary in any particular manufacturing processes. The Physical Testing Laboratories at the Council House are very completely equipped with most up-to-date appliances, and the heat-treatment shops and furnace showrooms are well worth a visit from any manufacturer who wishes to keep up-to-date and work on the most economical lines

MOND GAS RESIDUALS.

An interesting exhibit is that of the South Staffordshire Mond Gas (Power and Heating) Company, who display a number of manufactured products from the bye-products obtained in the manufacture of Mond gas. Mond producer gas is extensively used in many industries of the Black Country; and the Company's plant, which is the only one of its kind in the world, has an output of over 1½ million cubic feet of gas per hour. The buildings and land of the Company comprise nearly 100 acres. It was pointed out that one ton of coal treated by the ordinary method of gas manufacture will yield about 12,000 c.ft. of gas and 13 cwt. of coke; whereas in the Mond process about 110,000 c.ft. of gas

is obtained, without the production of any coke, for a similar amount of coal.

Gas Mantles.

The Welsbach Light Company have an attractive exhibit for gas lighting and heating. In a central position is a huge incandescent mantle, standing on a "rock," which is designated "Tower of Light and Tower of Strength." There is also a striking model of an inverted burner. A new pattern of burner for bathrooms, halls, &c., is fitted with a finished mantle instead of a soft mantle. Built up on the Kern burner bunsen tube, this fitting gives an 8 c.p. illuminant; and taking the average cost of gas at 4s. 6d. per 1000 c.ft., a period of five hours' lighting is provided for a farthing. There are some notable Kern gas-radiators which possess an advantage in the pure mixing of gas and air. On the stand are also displayed superheater lamps and street lighting sets, improved street lanterns for public lighting, and a large range of fittings. A variety of lanterns for street lighting are now fitted with hinged tops. The illuminant is provided by inverted superheater clusters, in varying numbers. The 22 different processes through which the ordinary mantle passes from the raw material of the stalk of the ramie plant to the many patterns of the finished article are shown.

Gas Controller, &c.

The "Controla" Engineering Co., Ltd., Birmingham, show the "Controla" gas controller—a machine of improved design and workmanship for maintaining a uniform pressure of gas for furnaces and engines, also in connection with lighting, heating, and cooking. It is claimed that a 10 p.ct. saving in consumption is obtained, and that frequent adjustment of burners and mixture valves is obviated. The machine is made in all sizes; and it is kept under inspection for five years. In passing through the machine the high-pressure gas is considerably enlarged in volume proportionately to its reduction in pressure, so that it is quite possible that with the meter on one side registering only 1000 c.ft. consumption the actual amount of gas delivered to the lights, furnaces, &c., may be as much as 1200 c.ft.

Messrs. Duguids, Ltd., Manchester, exhibit fuel-saving appliances, including Hay's CO_2 and draught recorder gas analyzer, gas collector (sampler), draught gauges, and flue-gas thermometers.

Gas-Engines.

There is a large show of gas-engines; and most of them are to be seen in motion. They are displayed by the following firms: Messrs. Tangyes, Ltd., Birmingham; Messrs. Petters, Ltd., Somerset; the National Gas-Engine Company, Ltd.; the Heatly-Gresham Engineering Company, Letchworth; and Messrs. Crossley Bros., Ltd. The Heatly-Gresham Company display a 10 H.P. gas-engine dynamo set (which lights their stand), and gas-engines up to 22 B.H.P.

Gas-Ovens, &c.

The display of gas-ovens is interesting, but smaller than might have been expected. Gas-furnaces of various kinds are featured by Messrs. Gibbons Bros., Ltd., Dudley, as well as regenerators and refractories; and Messrs. Achurch, Ltd., display the "Glow" portable gas-heater, and a combined radiator of heat and boiling stove, the latter being compact and easily connected to any gas-fitting.

Gas-Fittings, &c.

The display of gas-fittings is extremely good, and many of them show much artistic merit. The firms showing are: Messrs. Thomas R. Carpenter, Ltd., Birmingham (large range of inverted pendants, inverted shade pendants, and inverted scroll brackets. Messrs. W. Whitehouse & Co., Birmingham (gas brackets and pendants of all kinds, including rodding brackets and small gas-joints, cocks, &c.). Messrs. Evered & Co., Ltd., Smethwick (gas-fittings, many in beautiful oxidized silver finishes). The British Brass Fittings Company give a representative display of brass goods manufactured in the four factories of the amalgamated firm (Messrs. Sperryn & Co., Charles Joyner & Co., Ingram and Kemp, and Player and Mitchell); and gas-fittings have a very prominent place. Messrs. Best and Lloyd, Ltd., Handsworth, Birmingham, in a choice exhibit, make a feature of their "Greater Surprise" pendant, which has been described in the "Journal." Messrs. J. A. H. Hunt, Birmingham, show a comprehensive range of gas-fittings.

In Building C, Messrs. Messenger and Sons, of Broad Street, Birmingham, are showing specimens of their shadowless gas-fittings. In this device one of the three points of support of the dish or bowl can be easily disengaged, giving perfect access to the burner and the inside of the dish for cleaning purposes. Previous objections to indirect lighting for gas are thereby entirely removed, thus producing a most effective and ideal dish light.

Coal-Gas Welding.

On Stand 169, in Building B, Messrs. Hancock & Co. (Engineers), Ltd., of Wallington, Surrey, have much to interest the gas industry, particularly in the exposition of their method of coal-gas welding. Success in the ever-increasing art of welding depends partly on the construction of the blowpipe and partly, of course, on the use of the correct materials and fluxes. To both these details Messrs. Hancock pay close attention. The advantages they claim for coal-gas welding are many; and they include freedom from danger, the cheapening of first cost and running cost, a great saving in oxygen, and ease of operation. Further, it is claimed that the process gives a perfect weld. Ordinary town gas supply at low pressure is used in the operation.

TESTING REFRACTORIES.

Mr. W. J. Rees, B.Sc.(Tech.), F.I.C., Lecturer on Refractories, University of Sheffield, recently read a paper on "The Testing of Refractories," before the Birmingham and Midland Section of the Society of Chemical Industry, at the University of Birmingham.

The life of the refractories used for the construction and maintenance of a furnace was dependent, he pointed out, on a variety of factors, of which the following are the most important: The softening temperature, the mechanical strength at normal and high temperatures, the thermal or reversible expansion, the permanent expansion or contraction, the resistance to abrasion and to slag attack, and the resistance to abrupt changes of temperature. The conditions which refractories have to withstand are being more precisely examined, and the conclusive test is obviously the behaviour of the material under service conditions. The standard methods of testing proposed by the Refractories Section of the Ceramic Society are well known and widely used. It is, however, desirable that tests should be conducted under conditions which are as near to the conditions of actual use as is possible. In his opinion, tests on whole bricks are much more valuable than those on small portions of the brick. Better still is a test on a section of built-up brickwork. Chemical analysis is, in general, the first test to be conducted; but, while important, it is an insufficient guide to the behaviour of a refractory, as it takes no account of the texture of the material.

In the one word "texture" may be summed-up the homogeneity, extent of vitrification, porosity, and the size and shape of the grains. The mechanical resistance of a refractory to the abrasive action of hot dust-laden gases is mainly a factor of its texture; but its chemical resistance to the attack of the dust will be largely determined by its chemical composition. In regard to the determination of the softening or fusion temperature, it is desirable to make the test on not less than three pieces. The type of furnace recommended is the Hirsch electric furnace; but he had found coal-gas fired furnaces quite satisfactory for the purpose. He had frequently tested the softening point of whole bricks by placing them on a refractory convex surface in a large gas-fired furnace and observing the temperature at which deformation of the brick occurred. In several instances the softening temperature of the whole brick has been 50° to 150° C. below that indicated by the test on the small samples. In the whole-brick test, the influence of furnace atmosphere can be better observed. Observations had been made by investigators in connection with the whole-brick tests of the temperature of the exterior and interior of the brick. His own observation indicated a temperature difference of 20° C. with silica bricks and 30° to 40° C. with fireclay bricks after four hours heating to 1000° C. At 1300° C., the temperature difference after eight hours' heating was reduced to 10° C. and 15° C. respectively. At 1500° C., it is probable that, under the conditions of these tests, the temperature of the brick is nearly uniform throughout.

The cold crushing strength of firebricks varies with the texture and extent of burning or degree of vitrification. The mechanical strength of fireclay bricks is much lower at high temperatures because of the gradual formation of a viscous condition in the brick. Mellor has shown that the sensitivity of a fireclay brick to load is greater the greater the alumina content of the clay, and, conversely, the sensitiveness decreases as the silica content increases. With ordinary coarse-grained silica bricks the loss of mechanical strength at high temperatures is much less than with fireclay bricks, because of the greater viscosity of silica and saturated silica melts. Very fine-grained silica bricks show a greater loss in strength than the coarse grained, unless they have been so well burned that there is a good deal of recrystallization of the silica. Tests under load are preferably carried out on whole bricks; the load being applied by means of a lever system. A good method is to apply a load of 50 lbs. per sq. in. to the brick and observe the temperature at which a definite degree of deformation takes place. Results indicated conclusively that in firebricks containing free quartz, the thermal properties of the quartz are only slightly masked by the presence of the fireclay.

In regard to after-contraction or after-expansion, a test designed to indicate the volume changes which a brick is likely to undergo when in use at high temperatures was slowly to raise the brick to a temperature of 1410° C. and maintain it at this for four hours. The resistance of a refractory to the corrosion of a slag dust or ash may be roughly determined by drilling a hole in the material, filling it in with the slag or ash, and heating under pre-determined conditions. It is, however, better to cement on to the face of the brick a clay ring and fill this with the slag or ash, as the face or skin of the brick is not then removed. The lower porosity of the face of the brick may reduce the speed of the corrosion.

DISCUSSION.

Dr. Brownsdon (the Chairman) gave Mr. Rees a cordial welcome back to his old section, and asked for a simple test which would enable one to classify a brick for some special purpose.

Mr. T. F. E. Rhead (Chief Chemist of the Birmingham Gas Department) said the staff had learned to respect refractories. There were so many pitfalls in testing that it was most desirable not to be dogmatic about the results. The question of atmosphere seemed to be one that needed considerable elucidation.

Mr. Rees said he considered the load test was the most useful for classification purposes, if there were to be only a single test.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Annual Meeting.

The Fifty-Second Annual Meeting of the Institution, which was held on Friday last, at the Midland Hotel, Manchester, was unusually successful. There was a large attendance, most of the towns in the wide area covered by the Institution being represented; and the visit to the Bradford Road gas-works—the chief works under the control of the Corporation Gas Committee—was greatly appreciated.

Alderman Wm. Kay, J.P. (the Chairman of the Gas Committee), was unable to be at the works to bid the visitors welcome; but he was well represented by Councillor Cundiff (the Deputy-Chairman of the Gas Committee) and by Councillor Harrison and Alderman Watmough (the Chairman and Deputy-Chairman respectively of the Sub-Committee charged with the oversight of the Bradford Road works). Mr. J. R. Hill (the Acting Chief Engineer for the Manchester Gas-Works), Mr. Alfred L. Holton (the Manager of the Bradford Road works), Mr. Godfrey W. Kaye (the Secretary to the Gas Committee), Mr. J. H. Sillitoe (Gas Department), Mr. C. N. Dixon (Works Superintendent), and Mr. Hawkyard (Assistant Superintendent) were also present.

A Transformation Scene.

To those who had not seen the Bradford Road works for a few years, the present visit was a great surprise. "What a mighty transformation," one could not help saying, gazing upon the big extensions now being built, involving an expenditure of half-a-million pounds or more. Every device for the most efficient and economical production of gas has been put in operation, or very soon will be. Some idea of what is going on at these works, which in the end will place them on a par, at least, with any other gas-works outside London, may be gathered from the following particulars which were given to the visitors for their guidance as they passed through the works.

Condensers.—These are of the vertical tubular water-cooled pattern as made by the contractors, Messrs. R. & J. Dempster, Ltd., of Newton Heath, Manchester, each column containing 240 3-in. tubes. The Clapham condensers at present in commission are afterwards to be brought to this site.

Exhausters.—These are of the usual four-blade type. The contractors are the Bryan Donkin Company, Ltd., of Chesterfield.

"P. & A." Tar Extractors.—The makers of these are Messrs. W. C. Holmes & Co., Ltd., of Huddersfield.

Scrubber Washers.—These also are made by Messrs. W. C. Holmes & Co., Ltd., and to their usual brush pattern. The site is also prepared to take two Kirkham washers at present in commission.

(All the above are set out in units for four million c.ft. a day.)

Coal Sidings and Stores.—These are being extended and run alongside the London and North Western Railway (late Lancashire and Yorkshire Railway). Contractors: The Fram Reinforced Concrete Company. The estimated capacity of the new stores is 20,000 tons.

Vertical Retort-Houses.—The first pair are being erected by the Woodall-Duckham Company, Ltd. Each of these houses will contain 24 retorts of seven tons of coal per diem capacity—*i.e.*, 168 tons per day per house. The total capacity of the plant is estimated at four million cubic feet per diem.

The second pair of vertical retort-houses are by West's Gas Improvement Company, Ltd. Each house will contain eight settings of eight retorts (64 retorts) of 2½ tons capacity—*i.e.*, 160 tons per day per house, or a total capacity of four million cubic feet per day.

The coke will be removed by telpher machines, which will carry it from the floors of the houses to coke hoppers in front. There will be one set of hoppers to each pair of houses. Alternatively, the coke can be stored in the coke yard adjoining.

Telphers and Tracks.—These are by Messrs. Strachan and Henshaw, Ltd., of Bristol, and the reinforced concrete hoppers and telpher legs by Messrs. D. G. Somerville & Co., Ltd., of London; but both come under the West's Gas Improvement Company's contract.

New Road.—To the north of the retort-houses, and approached from Broxton Street, a new road is being made, which will take all coke and similar traffic, thus relieving the Bradford Road entrance. The necessary weigh-house and weighbridges are under construction; the former by Messrs. G. & J. Seddon, of Little Hulton, the latter by Messrs. W. Hodgson & Sons, of Manchester.

Across this new road is the No. 6 gasholder, erected ten to twelve years ago by Messrs. Ashmore, Benson, Pease, & Co., of Stockton-on-Tees, to the design, and under the supervision, of the late Mr. J. G. Newbigging, M.Inst.C.E., and a Past President of the Manchester Institution. The brick and puddle tank (also to his design) was built by Messrs. E. Nuttall & Co., of Trafford Park. The holder is one of the largest in the country. Its capacity is over 10,000,000 c.ft.

Meter House.—Along the new road, the new house, constructed by Messrs. G. & J. Seddon, is reached. This house will contain seven station meters, each of about four million cubic feet per day capacity. Five will be removed from their present positions on the works, and there will be two new ones. The contractors for this portion of the work are Messrs. J. & J. Braddock, of Oldham.

Carburetted Water-Gas Plant.—This, erected by Messrs. Humphreys and Glasgow, Ltd., to their particular design, is east of the meter house. The plant is of a total nominal capacity of 8,000,000 c.ft. per day. Behind the carburetted water-gas plant an experimental gas-works, complete in every respect, has been erected for the testing of coals. The site alongside the experimental plant has been earmarked for the storage of fireclay goods; also for mortar mills, crushing machines, stonebreakers, &c. Purifiers for both coal gas and carburetted water gas lie south of the carburetted water-gas plant, and are of the water-seal type with revivifying floor for the oxide under the boxes.

Purifiers of the luteless type have just been completed for the first unit of vertical retorts. The contractors for these boxes were Messrs. C. & W. Walker, of Donnington, Salop. The roofs over them were erected by Messrs. Gibbons Bros., Ltd., of Dudley. Similar purifiers for the second unit of vertical retorts are being erected. The contractors for these are Messrs. Newton, Chambers, and Co., of Manchester and Sheffield, for the boxes, and Messrs. Painter Bros., of Hereford, for the roofs.

Coke Hoppers for Storage.—One set of these hoppers is fitted with breaking and grading plant.

Existing Exhauster and Boiler Houses, together with Cooling and Washing Plant.—When the new exhausters, &c., are completed and set to work, this plant will be cleared and the site utilized for new stores. The contract for these stores has been given to Messrs. J. Gerrard & Sons, Ltd., of Swinton.

New Boilers and House.—The boilers, three in number, have been erected by the Stirling Boiler Company, Ltd., and are fitted with underfeed stokers for burning pan breeze, &c. The house was erected by Messrs. Gerrard, of Swinton. The chimney was built by the Myles Premier Chimney Construction Company.

Electric Power House, fitted with Two 200-Kilowatt Generators.—Pending completion of the boilers, &c., the supply is being taken from the Corporation Electricity Department. A switchboard has been installed for controlling the supply to the various units throughout the works, and so arranged that the current to any unit can be taken from the works supply or from the Electricity Department.

Retort-house No. 2 has Drake's stoking machines and coke transporter—electrically driven. Retort-house No. 1 was reconstructed in 1915, and fitted with Fiddes-Aldridge stoking machines and Drake's coke transporters. Works for the manufacture of sulphuric acid and sulphate of ammonia.

Gasholders.—The four small holders are each of 1,700,000 c.ft. capacity, and the large one of 7,000,000 c.ft.

Meter and Governor House.—These meters are to be moved to the new meter-house alongside the new plant.

With these particulars was provided a map of the works showing the portions completed and those now in progress.

The Luncheon.

Leaving the Bradford Road works, by special cars provided by the Manchester Corporation, the party proceeded to the Midland Hotel, where luncheon was served. Mr. S. Tagg (the President of the Institution) was in the chair, and by his side were Alderman Kay, Mr. Harold Davies (Chesterfield), Mr. Cundiff, Alderman Watmough, and Mr. Harrison.

After the Loyal Toast had been honoured,

The President, in graceful terms, recognized the courtesy of Alderman Kay, Mr. Cundiff, and the other members of the Gas Committee in allowing the members of the Institution to visit the important works at Bradford Road.

Alderman Kay, in acknowledging the President's compliments, said that nothing gave himself and his Committee greater pleasure than to do all they could to further one of the most important industries in this country. Speaking frankly, he did not think the representatives of the gas industry made the most of their job—not up to now anyway. He had hopes, however, that they were beginning to appreciate what competition really meant, and were going to leave no stone or wheel unturned in their determination to make the gas industry stand higher in the estimation of the public. He reminded them of the persistent attacks made upon the gas industry, and commended them for their evident desire not to work for personal benefit only, but for the good of the industry as a whole and the country generally. He went on to say that he was at the meeting of the Institution eight years ago (in 1914), when Mr. Frith, the Secretary, was entering upon his duties; and it was singular that he should be at the meeting in Manchester again when Mr. Frith was retiring from the secretarial office. In closing, he expressed his conviction that, with the spirit of good comradeship and co-operation shown in the Manchester District Institution, the gas industry was going to play a greater part in the future than it had done in the past.

Presentations to Mr. and Mrs. Frith.

Alderman Kay, at the request of the President, then presented to Mr. G. S. Frith, of Runcorn (who had discharged the duties of Secretary with marked ability and courtesy), a gold watch, as a token of the members' cordial appreciation of his character and services to the Institution. Mr. Frith, he remarked, was not retiring altogether from work for the Institution, for he would take office as Junior Vice-President. To Mrs. Frith a beautiful silver bag was presented.

Mr. Frith, in happily chosen words, expressed his grateful appreciation of these testimonies. A reference to the *agenda* of the meeting in 1918 showed the kind of problems with which they had to deal at that time. These were the subjects discussed at the May meeting in 1917: (1) Labour difficulties, due to the demand for all eligible men for the army and national service; (2) coal supplies; (3) certification of gas undertakings under the

Munitions of War Amendment Act, 1916; (4) central tar distilling and refining works, and the marketing of benzole after the war. At that same May meeting, Mr. Thomas Glover addressed the members on the importance of making blue water gas. A resolution was passed at the same meeting protesting against the Coal (Pit's Mouth) Prices Order, 1917, being made retrospective. He mentioned these things to show how gas engineers had been called to swing from their ordinary work in the course of the past eight years.

THE BUSINESS MEETING.

The business of the annual meeting was then proceeded with—Mr. Tagg occupying the chair until the induction of his successor, Mr. Harold Davies, of Chesterfield. The minutes of the last meeting were confirmed.

New Member.

Mr. Edward Moore, of Wirksworth (Derbyshire), was welcomed as a new member.

The Committee's Report.

The Committee reported that the membership stood at 204; being a decrease of six as compared with the previous year. There had been three resignations, and four names had been removed under Rule 15. The Committee recorded, with feelings of deep regret, the deaths of Mr. Isaac Carr (Widnes), who was President in 1896, and at all times took a keen and important interest in the welfare of the Institution; Mr. Ernest Frith (Frodsham); Mr. Gerald Mitton (Penistone); Mr. Robert Porter (Elland), President in 1897, and at one time an active worker; and Mr. John West (Southport), Hon. Member, who had read several most valuable contributions before the members. The Committee also recorded, with sincere regret, the death during the year of Mr. Thomas Duxbury, at one time Engineer of the Corporation Gas-Works, Darwen, and President of the Institution in 1888. The Lancashire and Yorkshire Commercial Sections were carrying out a most important and very necessary sphere of labour, and every gas undertaking, whether large or small, must benefit very largely by the information that was conveyed to the members at their monthly meetings. Mr. E. H. Hudson (Normanton) was the Institution's representative on the Council of the Institution of Gas Engineers; and Messrs. W. Buckley (Droylsden) and F. H. Robinson (Harrogate) were their Institution's representatives on the Councils of the Lancashire and Yorkshire Junior Gas Associations respectively. The statement of accounts showed a credit balance of £19 13s. 4d. to be carried to the next account.

The report and accounts were approved on the motion of the President, seconded by Mr. S. Meunier (Stockport). Reports of Commercial Sections were presented—that of Lancashire, by Mr. Meunier, and that of Yorkshire, by Mr. Hudson (Normanton). The membership in both sections was increasing, and good work was being done.

The President spoke of the reports of the Commercial Sections as a record of very valuable work achieved during the past year. He moved the adoption of the reports.

Mr. C. S. Shapley (Leeds) seconded the proposal, and Mr. Samuel Glover (St. Helens), supported, and it was passed unanimously.

Recommendations.

Recommendations made by the Committee were approved, as follows: That the sum of five guineas be granted to the Benevolent Fund of the Institution of Gas Engineers; that Mr. E. H. Hudson (Normanton) be appointed the representative of the Institution on the Council of the Institution of Gas Engineers for 1922-23; that Messrs. W. Buckley (Manchester), and F. H. Robinson (Harrogate) be appointed the representatives of their Institution on the Councils of the Lancashire and Yorkshire Junior Associations respectively.

Mr. W. Rogerson (Middleton) is now Secretary in succession to Mr. G. S. Frith.

Mr. Shapley asked leave to make some reference to Mr. Walter Hole, of Leeds. Mr. Hole had been a most useful member of the gas industry for 47 years. In the positions he had filled in association with the gas industry at Leeds, Mr. Hole had rendered most excellent service, and now, in retiring, it was pleasant to think he was not leaving Leeds, and that he had placed his services at the disposal of the Corporation of Leeds.

On Mr. Shapley's proposal, seconded by the President, the meeting passed a resolution placing on record their appreciation of Mr. Hole, and the excellent work he has done for the gas industry at Leeds.

Mr. Hole expressed his gratitude for this mark of appreciation of his work in the past.

Induction of the New President—Thanks to the Retiring President.

The new President was then formally inducted by the retiring President (Mr. S. Tagg).

Mr. Davies prefaced his address by referring in cordial terms to the good work done by his predecessor in office during the past year. He moved that the best thanks of the Institution be accorded to Mr. Tagg for his valuable and efficient services as President. This was seconded by Mr. G. P. Mitchell (Blackburn), and carried with acclamation.

Mr. Tagg, in his acknowledgement of the compliment, hinted that a visit might soon be paid by the Institution to the low-temperature carbonization works at Barnsley. It was left to the Council to arrange for such a visit at an early date.

Mr. Davies then delivered the following

PRESIDENTIAL ADDRESS.

Gentlemen,—In thanking you for the very high honour I have received by your electing me to fill the position of President of this important Institution for the ensuing year, I am grateful for the confidence thus shown, inasmuch as I have hitherto been a somewhat silent member of our assemblies. You may, however, rest assured that it shall be my fullest endeavour in the task allotted to me, and with your generous assistance and consideration (which I know will not be withheld) to carry on the work of the Institution, so that when my time comes to relinquish the office I shall have the satisfaction of feeling that your trust has not been misplaced, and that my efforts have been a useful link in the chain of office of the presidential chair.

Losses to the Industry and the Association.

Before I commence my address, may I express what I am sure are your feelings at having to record the loss of three of the best known men who have been connected with our Institution. I refer to Mr. Thomas Duxbury, Mr. John West, and Mr. Isaac Carr. I think we all have an intimate knowledge of the professional work of these three gentlemen, and most, if not all of us, have come into contact with them at some time; and with others the connection has been one of personal friendship. By all they will be greatly missed.

[Here the members rose, signalling thereby their sympathy with the families of the three gentlemen mentioned.]

Mr. Duxbury relinquished his official position under the Darwen Corporation many years ago, but later his merits as a man and a councillor earned for him the proud distinction of receiving at the hands of his fellow townsmen the highest honour which they could bestow upon him. Mr. Duxbury was President of this Institution in 1888.

Mr. John West was an outstanding figure in the gas industry—a man of indomitable courage and perseverance, and an example to every member of our profession. I am sure the gas industry will never really know how much it owes to Mr. John West. Our Institution in particular will miss his cheery optimism, his smiling friendship, and his generous nature; and as one of our honorary members whose life's work has been well done, we feel grateful at having had such a man associated with us.

Mr. Isaac Carr's name will be remembered as the supplier, up to the present time, of the cheapest gas in the world—a distinction which was linked-up to this Institution very closely by our having Mr. Carr as President in 1896. He was a frequent and valued contributor to our proceedings and discussions; and the result of his life's work will remain as a stimulating influence to all aspiring gas engineers.

The Position and Prospects of the Gas Industry.

The gas industry has passed through difficult times during the last few years, and the present will tax the resources of many undertakings. The depression in trade throughout the country has had its marked and deplorable effect upon industry generally, and we can hardly expect to be exempt altogether from resulting influences. Some consolation, however, may be gained by a reflection upon the remarks of Mr. Hudson at our meeting in Preston; and with him I feel that good may possibly come out of the evil times which we have experienced, and that with the carefulness to which we have been driven, progress and success in the future may be more rapid and assured.

Buying Raw Material, Manufacture, and Selling.

The duties of members of our profession have been divided into three heads: (1) The buying of the raw material; (2) the manufacture of such material into gas, coke, and other residuals; and (3) the selling of the products, with all the duties pertaining thereto. And what does this involve? Let me for a few moments try to bring out a few of the principles, which are not infrequently overlooked.

In the first place, raw material necessitates the design and construction of plant for its most economical utilization; and in this, due consideration is not always given to local conditions. I have known carbonizing plant erected of such a type as to be quite unsuitable for the utilization, by itself, of coal of the highest gas-making quality which could be delivered direct into the works from the collieries. The saving alone which would have ensued in haulage by railway and canal, to say nothing of cartage, would have been fully sufficient in the circumstances to rule the particular type of plant out of consideration. It may be argued that, with the development of present-day plant, such as vertical retorts, and complete gasification, the need for this discrimination is reduced to such extent as to be almost negligible. I do not, however, entirely agree; and I would suggest that the buying of raw material is a point which should, and no doubt does, engage the minds of most engineers when considering the design of plant for gasification purposes.

It is not my desire to dwell, but for a moment, upon these matters; but in considering the installing of our plant, whether as entirely original plant or replacements, due recognition of the position of the works and of the needs of the area of supply, both in gas, coke, &c., must be given. Industrial areas not infrequently demand the working-out of entirely different sets of ideas from

those which might be considered most suitable for residential districts.

In the selling of products, the character of the area in which these are to be produced will have a marked effect upon the line of action to be considered. One should always aim to produce coke of such qualities and quantities which would, given reasonable time and organization, be disposed of in that particular area. This, I know, is not so easy to achieve, and has partially led to the formation of our Commercial Associations. I would suggest to our members the many and varied opportunities which our Commercial Associations present for more comprehensive purchasing and selling of materials. Industries with whom we have regularly to deal have considered it desirable to organize some system of co-operation in the disposal of their different commodities; and why should not we give more consideration to co-operation in their purchase?

Take coal, the most important factor in our purchasing. Gas-works, large and small, would benefit by collective bargaining. My idea would be to appoint a Coal Purchasing Committee presided over by the ablest commercial man in the industry, and having the vision of (say) Lord Leverhulme, with power to purchase the millions of tons of fuel—the entire outputs of collieries, if desired—for the gas industry. Probably I shall be told that such a procedure would inevitably destroy individualism. Well, let me suggest that such a valued talent should hardly be wrapped up in the napkin of its own local sphere—rather should it earn the commendation of the whole industry, "Well done thou good and faithful servant." The subject is full of doubts and difficulties; and men are placed upon this earth primarily to overcome difficulties, and true science exists solely to dispel doubts. Let us therefore be optimistic.

Take coke. I have on numerous occasions seen the industry in a tight place with respect to surplus coke; and one cannot fail to observe the fact that it is not infrequently the man with a hundred tons who upsets the market for the man with thousands of tons. Why should this be so? Surely it is not beyond the capacity of our industry to find some scheme of co-operation which would obviate the upsetting of the coke markets in this manner. We have been able to adopt this principle with our sulphate of ammonia; and I am looking to the Sulphate of Ammonia Federation to provide an excellent example of what is possible on these lines. With their experience to guide us, I am sure we need have no fear in embarking upon further co-operative schemes.

I must say that I have been for a very long time considering the lines our future efforts in these directions ought to take; and the policy in front of us, if the policy in other and allied industries (either directly or indirectly), is that of combination. I do not think I need further enlarge on this matter, as you are all aware that we are affected in nearly every direction; but I do hope that the sphere of usefulness of our Commercial Associations will be much further developed in the near future. I am sure we have the ability and the energy to bring to a successful issue any efforts we may make.

THE GAS REGULATION ACT.

The introduction of the Gas Regulation Act gives occasion for much thought to gas engineers throughout the country; and for this alone it must be welcomed as a stimulus which should eventually benefit not only gas undertakings, but their consumers of every grade. The Act brings with it the necessity for a regular supply of gas of constant calorific value and density—two essentials which will, without doubt, require most careful and exact attention on the part of those responsible for their production. Many of our present methods, both in large and small works, will require to be remodelled. As a single illustration only of my meaning, I would refer to what I term the very haphazard method in many cases of the production and mixing of blue or carburetted water gas. Frequently introduced as one means of helping over what may have been the difficulty of capital, or the supplementing of gas-making plant which by its state of repair has resulted in a reduced (and consequently insufficient) output, or such plant having exceeded its useful life, the management have perhaps deemed it wise to seek an alternative to renewing or replacing such plant at a cost which may have seemed prohibitive.

I am not by any means decrying the introduction of water gas, either blue or carburetted; but the time has come for many managers carefully to consider whether it will be at all possible to carry on under the conditions which a large number of undertakings have seen fit to introduce during recent years, bearing in mind the necessity for complying with the new Act, or of taking the consequences of having to supply a gas much higher in thermal value than they have declared at the price fixed, so as to avoid the penalties which may be incurred.

The Act, without doubt, will give to gas consumers a new charter, which will carry in its train much development in the use of our prime commodity. The field for heating with gas of a constant calorific value, density, and pressure will have no rival, and the scope is almost unlimited. To many engineers to-day, having what may be reasonably termed old-time plant, the question is: What action shall be taken to bring our gas production into line with modern requirements? Many of these plants, in spite of moderate age, have been well maintained, and yield good results, gauged upon standards appertaining but a few years ago; but with the passing away of candle power, and the birth of the therm, results have to be looked at from rather a different standpoint. If gas of (say) 450 B.Th.U. per cubic foot is to be considered as a standard for use by the majority of gas undertakings, how can this be best secured without the scrapping of much of the plant at present in use? I have been engaged during the past two years in endeavouring to achieve this object; and while no doubt there is nothing original in my methods, perhaps a short account of the work may be interesting to many who will be commencing upon somewhat similar lines.

RECONDITIONING AT CHESTERFIELD.

The gas-works at Chesterfield were re-built 49 years ago, from the design of Messrs. T. & C. Hawksley, Consulting Engineers. Some of the manufacturing plant has since been superseded, yet the buildings remain as a monument to their skill in design, and at the same time provide an example of the old school in building construction for gas-works purposes. The old scrubbers and purifiers are still in use; and it is no exaggeration to say that similar plant of modern construction and first-class design would be constructed from less than half the weight of the metal employed in the making of this old plant. The carbonizing plant, as I found it, consisted of twelve beds of seven inclined retorts, in a rather neglected state (due probably to war-time conditions), hydraulic mains and tar pipes of ordinary design, no tar-towers or retort-house governors, but with a hot-coke conveyor and small coke screening plant and hoppers attached.

A general cleaning-down was the first necessity, followed by a renewal of retorts, furnaces, and staying of the beds; a general overhaul of hydraulic mains; replacement of the charging machines; and extensive renewals to coke handling plant. This was followed by the introduction of a retort-house governor, and tar-towers, which are now in hand. This plant will yield a maximum daily output of 1,250,000 c.ft. of "straight" coal gas, with ten-hour charges of 10 cwt. each, or a total weight of coal carbonized daily of 106 tons, with about 12,000 c.ft. of 520 B.Th.U gas per ton.

As this output is perilously near our mid-winter send-out, I decided to recommend my Board to put down a blue water gas plant, which Messrs. Humphreys and Glasgow supplied; and a new and larger station meter was also put in. Three gasholders of a total capacity of about a million cubic feet were in use, and the smaller, a three-lift of 177,000 c.ft. capacity, was utilized as a relief holder for water gas. A suitable exhauster was put down for withdrawing the water gas from the holder and passing it through four purifiers—part of the original plant which had been superseded. Afterwards it was measured in the old station meter, and mixed with the coal gas at the outlet of the new station meter. We have thus two complete sets of plant; and a very regular mixture of the two gases is accomplished. The mixed gas is of a calorific value of 480 B.Th.U., and consists of 80 p.ct. of coal gas and 20 p.ct. of blue water gas.

The great difficulty with the inclined retorts has been to secure a regular mixture of the coals purchased, and regular charges into the retorts; but with most works this difficulty is not insuperable. Engineers having inclined retorts, however, know how great are the obstacles in the way of regularity with gravitation charging in this type of plant, and the consequent variation in the calorific value of the gas yielded therefrom. This, however, has been reduced to a minimum by careful arrangement and supervision; and by the addition of a carburetting set to the water-gas plant (which work is now in hand) I am hoping to have such control as will enable me to keep the calorific value of the gas within reasonable limits of that which is likely to be declared for my Corporation under the Gas Regulation Act, and to which I expect to work—namely, 480 B.Th.U.

DISTRIBUTION PROBLEMS.

Having as far as possible achieved in good measure gas of the requisite and regular calorific value, without any serious expenditure of a capital nature, I at the same time have had to give most serious attention to its distribution; and here I have been up-against my greatest difficulty. Chesterfield is a borough which has grown rapidly in recent years, and with each extension of its boundaries has been added increased responsibility from every point of view of a municipality; but the responsibility of the gas undertaking has, up to the last eighteen months, extended to an area much in excess of that represented at the time by the boundaries of the borough of Chesterfield. In consequence of this, the supply of gas has been in the hands of a Joint Board, and only by the last extension of the borough in 1920 was the Board abolished; the undertaking then coming under the full and complete control of the Corporation.

It is obvious, therefore, that if the boundaries of an undertaking are extended, or districts brought into the supply which have hitherto had no connection with the undertaking's mains, or even when so connected have shown marked development as industrial areas with the added housing accommodation needing an efficient gas supply, the area thus brought in must of necessity be upon the extreme edge or fringe of the gas supply; and, as might have been expected, the gas-mains leading to these districts were quite inadequate to give the supply of gas needed. When coupled to the districts, the total demand so overloaded the mains that not only was the new area inefficiently supplied, but the districts which were previously supplied from the leading mains began to have serious cause for complaints of inadequate pressure. Two small boosting sets were then in consequence installed, and the supplies of high-pressure gas therefrom

conveyed in opposite directions from the works in special mains. Unfortunately, in the most important direction this main was not carried far enough, nor was the plant or main of sufficient capacity to cope with the needs of the rapidly developing colliery district needing the supply.

This was the position in the particular part of our area as I found it, at a time when cast-iron mains, or indeed any other type of distributing plant, were so prohibitive in price as to put out of question altogether the capital expenditure required to lay the necessary trunk mains. The obligations of the undertaking were, however, not a burden to be shelved, and means had to be found, at any rate, to tide over the difficulty. Fortunately, a very well equipped battery of coke-ovens were operating in this particular area, and at such a convenient point that supplies of their gas, if obtainable, could be carried into two of the adjacent districts. The Coking Company were in consequence approached with a view to supplies of gas being purchased from them in bulk. I think the circumstances were somewhat unique, as my Board were eventually offered purified gas, of a regular calorific value, delivered into a small two-lift gasholder which was the property of the colliery company running the coke-ovens. Thence mains were run to two station meters; and a maximum volume of gas per twenty-four hours of 150,000 c.ft. was put into the district through two mains, with marked beneficial effects in the gas supply over the whole of this area. Unfortunately the supply was cut off during the coal troubles of last year; and, as most of you are fully aware, coke-ovens were in no great hurry to resume operations at an early date after this stoppage. I am, however, now taking whatever quantity of gas can be given us from this source up to our maximum capacity, and a trunk main from our works has already been laid part of the distance in the direction of this district; and I am hoping that now cast-iron pipes are falling in price my Corporation will consider it a sound business proposition to complete the scheme, the main pipe-line of which can, with slight alteration, be converted at any time to a high-pressure main for boosting purposes.

But this dealt only with one area; and I was yet up-against the shortage in supply to another district, ranging from a quarter to three and a half miles from the works; and it was decided to deal with this by laying a new trunk main for a distance of about one and a half miles from the works, and included in which length were the adjacent streets, covering a large district of our gas area with a very considerable number of our consumers. Provision was made in the size of this main to ensure an adequate supply for all consumers up to the full length of the pipes laid, and also a good surplus margin to fill the requirements of the outside district through the existing mains; and so far the pressures of gas in this area are such as to fulfil the requirements of the new Act. The laying of these trunk mains necessitated also the laying of a new 18-in. main from the works into the adjoining roadway, and the fixing of an additional 18-in. station governor.

With the last extension of the borough of Chesterfield, in November, 1920, a large area was included which was, up to Dec. 31, 1920, supplied with gas by the Whittington Gas Company, Ltd., with an annual output of 55 million c.ft. This undertaking was purchased, and became the property of the Corporation on Jan. 1, 1921. The gas-mains in this area are now coupled to the Chesterfield works; and a full supply of gas can at any time be given from that source whenever it is deemed desirable to do so. Up to the present, however, the Whittington works are in operation, and steps are being taken gradually to bring the calorific value of the gas supplied from these works into line with that supplied from Chesterfield, so that we may have a reasonable working measure of uniformity, as one standard of thermal value for the whole area will be applied for under the new Act.

I hope I do not weary you with this recapitulation; but I feel sure that many gas undertakings of the size of, and even smaller than, Chesterfield, are up-against similar difficulties, and I do urge engineers to tackle their responsibilities and press upon their committees and directors the necessity for providing not only the means for manufacturing a regular quality of gas, but all the distributing equipment essential for its proper supply and use. My experience is that it pays well to look ahead and have in mind all the time the needs of our consumers, as efficient service will bring the business to put our undertakings upon a sounder footing and add to the prosperity of the industry.

HOUSING SCHEMES—ADVANTAGES OF GAS.

This Institution has, I know, done pioneer work in drawing up regulations for the laying of gas-pipes and fixing of fittings upon consumers' premises; and I would just like to draw attention to this work, as the necessity for it has been borne upon me with more force than ever during the past two years. My Corporation have in hand schemes for the erection of 1000 houses within the borough. A large number are completed and occupied, and quite as many are still in varying stages of completion. The Town Council, prior to my appointment, had, I think, already made up their minds to adopt electricity for lighting purposes. I was, however, given an opportunity of putting the case for gas before them when my Board asked the Corporation to consider the cost of laying the necessary gas-mains, and to guarantee interest on the capital outlay to be entailed. The members of the Housing Committee, and especially the Chairman, were business men; and when the cost of laying both gas-mains and electricity cables was placed before them, it was realized that the cost of the dual scheme was prohibitive. As gas could claim advantages for domestic uses which electricity could not economically afford, the decision was given to adopt gas only. I should like to say this for the Electricity Department, that they realized it was no business proposition to take on the expense of running cables and services to these building estates for the purpose of securing the lighting loads only from the type of property to be erected. In this I think they were wise, and, in saying so, perhaps I might throw out a hint to municipalities owning both the gas and electricity supply undertakings in their areas to watch that needless capital expenditure is not incurred on the one hand, and that capital already expended is not caused to be idle on the other by what has to my certain knowledge been (to put it mildly) insane competition.

Personally, I am a great believer in competition on right lines, and there is a great field for both gas and electricity on which to devote their energies, on economic principles; but do let us get away from the spirit which urges us to snatch at each others' business, without due thought as to the ultimate result from the £ *s. d.* point of view.

The work of fitting-up the whole of these new houses with gas-pipes and fittings was placed unreservedly in the hands of my department; and I am quite sure that the steps taken to ensure an adequate supply of gas to every point for either lighting or heating will prove of immense benefit to the occupants of the property—and, incidentally, to the Housing Committee—and at the same time demonstrate to local architects and builders, in a very practical manner, the need which my Committee and Council are pressing forward for proper regulations, inspection, and general control in this direction. I may say that I have found the local architects very willing to accept the advice proffered in such matters, and are making their specifications and quantities, as to gas equipment, conform to the wishes of the Council; and this I feel is all to the good.

It is not sufficient, however, to produce a regular quality of gas and to distribute it. The administrative side of the undertaking also must receive careful organization and close supervision; and with this I must confess I am not at all satisfied at Chesterfield. The outside work of my department is unfortunately not controlled under one head. The powers that be have considered it more economical to place the work of main and service laying and repairs in the hands of the Water Department's staff, who act as contractors for such work to the Gas Committee. The work is, of course, carried out under the direction of my department, who are also responsible for the provision of all pipes required. However well this work may be done, I am quite sure that such a procedure does not tend to that closeness of control and supervision that is so very essential.

OFFICE AND SHOWROOM ACCOMMODATION.

With regard to general district work, such as complaints and installations, I am somewhat crippled by lack of reasonable office and showroom accommodation for the work; but my Committee are fully alive to the necessity for this, and I trust that in the near future premises will be acquired and fitted in keeping with the needs of the undertaking and its consumers. When this time arrives, I hope to have a proper system organized to cope with this important work. In the meanwhile, the staff at my disposal are being trained on lines which, when fully developed, will lead to greater satisfaction to consumers, and also a substantial increase in the business which has been steadily developed for some years and now assumes substantial proportions for the size of the undertaking.

METER READING.

The question of meter reading is one which my Corporation have deemed it advisable should be under the control of the Borough Accountant, on the grounds, I believe, that slot-meter inspectors collecting money should be directly responsible to this official. My greatest concern, however, is that this work should be well and intelligently done, so as to give the least possible cause for complaints from consumers and bring about the least possible friction. I have held the opinion during the whole of my career that all persons employed in this work must be responsible men and capable of inspecting in every sense of the word. Every man should be well taught and examined, not only in meter reading, but in the systematic and careful inspection of each meter with its tap and connections, as also in the systematic testing of meters either after removal from consumers' premises or *in situ*, to detect cases of defect. Such responsibilities cannot be taken by men untrained in the work, neither is its importance realized by them. Meter inspectors are the men who are in constant touch with one's consumers, and through them to a very large extent it is possible to feel the needs of not only individuals, but districts within an area of supply; and the severance of such staff is, in my opinion, a retrograde step in the efficient management of any gas undertaking.

CONSUMERS' APPLIANCES AND STORES.

Every gas undertaking to-day must feel the absolute necessity for the most careful and judicious selection and purchase of all descriptions of consumers' appliances, and any laxity in the matter of either buying or selling (and in this latter category I place the advising of consumers as to the right article to purchase) must carry with it serious consequences, both temporary and permanent, to the finances of the undertaking.

The stores and the stocks held therein are to-day affording the gas manager plenty of scope to prove his ability to cope with the

difficulties experienced by tradesmen. Falling prices are not conducive to the holding of large stocks or the making of large purchases beyond the needs of the immediate future. Still I would not have it inferred that I am suggesting the depletion of the necessaries of our business beyond such a reasonable limit as would naturally suggest itself to each individual circumstance. We all know the difficulties of the times; and the manager who systematically buys upon a sound competitive basis, as far as lies within his power, is benefiting his own concern and consumers and the industry generally.

HIGH PRICE OF APPARATUS AND SALES DEVELOPMENT.

I would here just like to touch upon the development of our business through cookers, fires, and other heating apparatus. This has without doubt had a serious set-back through the high prices which have prevailed—and, might I say, still prevail—for these articles. Simple hire rates are impossible within reasonable limits, and many undertakings have had to resort to hire-purchase terms in order to place the business on a sound financial basis, with the inevitable result—the retarding of the development of the sales department and the output of gas. I trust that during the present year makers will see the necessity of bringing their prices down to a level that will allow the return of the free cooker, for I feel confident this would benefit all concerned.

Much work has been undertaken by the National Gas Council and by manufacturers on the standardization of gas-cookers; but we have yet to await the accomplishment of the object set out to attain, and which has been looked forward to patiently by many engineers, who have waited with the hope that the labours expended might have resulted in a substantial reduction in the prime cost of the articles and the subsequent cost of their upkeep. However, the hope still remains, and, with falling prices, perhaps we may have some scheme of standardization which will meet with the approval and have the support of the gas industry generally.

METER DETERIORATION.

The question of deterioration, coupled with the repair and maintenance costs of gas-meters, is to-day one for serious consideration by every gas undertaking. Meters of the dry type, which have been almost universally adopted for the prepayment system, are becoming increasingly expensive in upkeep. In saying this, I do not particularly desire to refer to the unit cost of repairs which meter makers are to-day charging, though I feel that I should be more than justified in dealing with this subject. What I am, and have been, anxious to investigate is the causes which are leading to the very large percentage of defective meters of this type which we are now experiencing. I have, during the past two years, sent a large number of such meters to many makers for investigation and repairs; but up to the present time I have not been able to secure any report which would lead to a solution of the difficulty. I have had the spraying of meters in use for some time, and received considerable benefit from it; but the period has not been long enough for me to say whether the remedy is sufficiently permanent to be of continued service.

Many meters are passing small quantities of gas without registration; and the main cause is undoubtedly the diaphragms. A large number of these meters have been in continued use upwards of fifteen years, and the time has more than arrived for a systematic survey, coupled with a scheme for the testing of the accuracy of all dry meters. This has been an expense provided for annually in many undertakings, and the work regularly carried out; but I fear it is not the general practice, especially in smaller undertakings, where the staff is not large enough or trained to deal with the work. It will be realized by all that any continued neglect in this direction will be increasingly detrimental to the undertaking; and if the subject has not already been tackled with a determined spirit, I would urge, in the interests of good management, that there should be no further delay.

THE BURDEN OF RATES AND TAXES.

In dealing with the finances of our undertakings at the present time, one cannot overlook the heavy burden imposed upon us in the shape of rates and taxes. The incidence of this taxation was never more open to criticism than now; and in looking over the published returns of a very large number of both company and municipal concerns, one finds an amazing variation in the amounts called for per 1000 c.ft. Whether this is accounted for by the bulking of the two items I am not in a position to state; and I would suggest to the publishers of all such returns that in future the rateable values and the rates paid might with great advantage be separately ascertained and included in the published tables. The information would be of great advantage when the time arrives for the gas industry profitably to push forward a scheme for more equitable assessment of its undertakings. The hypothetical tenant has been dead for the past few years, or ought to have been; and the time is now most opportune for the birth of a new standard in this direction. The way in which such assessments have been dealt with in the past, and are even to-day being handled by assessment committees and their officials, shows such marked variation in procedure that I feel justified in endeavouring to arouse sufficient interest as to develop into action the energy and brains of controlling heads of gas undertakings with the co-operation of the National Gas Council.

Assessment for income-tax purposes is another complex problem. I speak now from a purely municipal standpoint—in fact, I have yet to find a member of a municipal council who fully understands how the ratepayers are affected by the incidence of this particular taxation on their undertakings. I would strongly urge all gas managers, and particularly those of undertakings owned by local authorities, to study carefully the compilation of the final annual assessment made, and note how it is arrived at.

The work is, I know, generally left to the accountant of the authority, and is frequently entirely in his hands, without reference to the gas manager, who sometimes cares little, and knows less, how his department and the whole finance of the authority is affected. I can assure you that I have come across some most interesting questions on the matter which have well repaid careful study. I am sure this Institution, although in name a body of gas engineers, would be most interested to have laid before them by a competent authority an informative paper on this subject.

CAPITAL CHARGES.

The question of capital charges to-day is one which cannot be left outside the scope of our consideration; and fortunate is the man who is in charge of an undertaking in an up-to-date condition, or otherwise blessed with an ample reserve account and a far-seeing body of men forming his committee or directorate. Municipalities are to-day borrowing at 6 p.ct., and many gas companies are offering 7 p.ct. debentures, as against 3½ p.ct. in the former and 4 p.ct. in the latter as a reasonable pre-war experience. When it is borne in mind the value of the pound sterling is deflated to little more than 55 p.ct., the heavy burden which present-day capital expenditure involves will be at once appreciated. I know this may be met by the argument that the saving consequent upon the expenditure is, under present conditions, correspondingly high; but it must be borne in mind that this saving is rapidly being reduced by falling labour costs, and in every other direction. Opportunities do, however, present themselves continually to gas engineers to weigh up the pros and cons in respect of capital expenditure; and in spite of the very heavy expense involved, a favourable chance frequently arises, and is taken, whereby the methods of our industry in all directions are enabled to be kept up-to-date.

IMPROVEMENTS IN PLANT.

I am sure the industry generally is greatly indebted to those undertakings and their engineers who, during the past five years, have provided the testing ground for many most important and far-reaching experiments. I do not propose to attempt to enumerate the many different types of plant, and the proprietors of the patent rights of which might resent my classing as experiments the really magnificent installations, carried out with true engineering skill. All of us will have watched with more than a passing interest the continuous improvements, both large and small, which are being made in every direction; but while it is not possible for everyone to be building new works, it is essential that all gas-works plant should, as far as possible, be kept up-to-date; and the opportunity occurs in small things perhaps more frequently than in large ones. Nothing, I think, appeals to me more than to see a small or medium-sized works exhibiting those signs which impress one as being the result of some well-organized and observant brain.

Take machinery lubrication as one small example. How much waste do we find in many works, through lack of either up-to-date knowledge or careless indifference! And yet there is here one of those opportunities which are frequently missed, and which really mean so much in £ *s. d.* Let me urge every engineer (if it is necessary) to take a survey of the whole of his plant, and carefully consider whether there is not one place at least in his works which could be profitably improved by the adoption of some modern device. I should be most happy to receive from members full particulars and results of any such profitable experiments with a view to the information being collated and circulated among our members, as I am sure it would be found not only interesting, but useful.

Looking at the technical side of our business, which is really a very important one at this juncture, in most of our larger works this is well developed, and has not been altogether neglected in many of our smaller and medium-sized gas-works. The necessity has, however, been felt for closer co-operation with, and utilization of, those resources of knowledge which are only waiting and anxious to link-up their research with the practical side of our industry.

EQUIPMENT AND ORGANIZATION OF TECHNICAL LABORATORIES.

A Committee of the Council of our Institution is appointed for the purpose of investigating how far it will be possible to utilize upon a useful and economic basis the equipment and organization of the technical laboratories of our district, both for the training of our staff, the carrying-out of chemical tests, and for the assistance which could be given in undertaking tests and the tabulation of experimental results which would have an added value by their certification from such qualified and independent authorities. We have the Livesey Professorship at the Leeds University, and know the valued work which has been, and is being, done by Prof. Cobb and his assistants; and it is not in the minds of the Committee that any scheme which may be submitted to you should in the least trespass upon the ground which has been mapped out for investigation from Leeds—in fact, the immediate aspirations of our Committee are to assist in co-operating with the education authorities in the setting-up of a well-equipped gas-works laboratory for carrying out tests required by any gas undertaking within

our area and the instruction of our staffs in making such tests, payment to be by fees upon an economic scale. I do not yet know how far it may be possible to carry this scheme into effect, but I do feel it should have a good measure of support. Our Scottish brethren have felt the need for some such organization; and I am sure we are not too self-satisfied to follow their lead.

THE MICROSCOPE AND OTHER USEFUL INSTRUMENTS FOR GAS-WORKS.

While on this subject, may I draw attention to the use of the microscope in the investigation of coal, and to point out its usefulness in the examination of commodities used by gas undertakings, which will doubtless suggest itself to many of our members. The gas industry purchases enormous quantities of incandescent mantles, which we see frequently described as one, two, or three ply; yet in the purchase, how many are subject to the investigation which will in most cases reveal the fact as to whether we are being actually supplied with the articles specified? The microscope will generally satisfy us completely.

Another little instrument which I have frequently found extremely useful, and one, I think, which might hardly expect to find a place in gas-works equipment, is the medical man's stethoscope. You are all acquainted with its use from a medical point of view; but how many gas engineers have invoked its aid in listening to what is happening inside our pipes and apparatus? The instrument, in the simple form, is inexpensive; and I can assure those who have not yet sought its aid that it can be very instructive when the ear is trained.

Many most useful instruments are to be found installed upon gas-works for various purposes, the knowledge of which would interest and benefit our members. I mention one only—the carbon-dioxide indicator or recorder. The many places where such an instrument would be of service and readily pay its initial cost and subsequent attention will suggest themselves; and its use upon the gas being made, either coal gas or water gas, will indicate or record in a large measure the efficiency of our manufacturing operations. My earlier remarks with reference to the adoption of modern devices, of course, apply to the laboratory as well as to works equipment.

A FEW CONCLUDING REMARKS.

We have at times been brought under criticism within recent years (and let me at the outset say quite unjustly in practically all cases) as to the prices being charged for gas. This resolves itself into an accusation that the gas industry is not economically managed; and before a body of gas engineers perhaps the accusation may be received without much concern. I mention the matter, however, in order that facts may go forth from our assembly to the public, and especially to our consumers. The average increase in the price of gas, comparing 1914 with the last quarter of 1921, as taken from the "Gas World Year Book," and as represented by the membership of this Institution, is 87·5 p.ct. The prime necessities of our industry are coal, showing a minimum increase of 128 p.ct. over the same period; workmen's wages 150 p.ct.; and maintenance materials 185 p.ct. In addition, we have the heavy burden of rates and taxes, increased beyond all proportion to the increase in the price of gas. If these figures are given fair consideration it will be a revelation to our consumers to find that the industry has been able to carry on with such a modest increase in its charges. The public should know that this has only been done by suspension in many cases of the efficient upkeep of works, and, in nearly all cases of company-owned undertakings, by the sacrifice of the shareholders, a large number of whom, by the reduction of their dividends (in some cases to vanishing point), have found themselves reduced almost to poverty. I am sure it is the desire of our members that gas consumers and the public should be informed that every gas engineer and manager, so far as lies within his power, is striving to-day for economy and efficiency which will effect reductions in the price of gas. The gas industry, along with all other industries, will feel the revival in trade when coal prices reach their economic level, and there is little doubt that we shall be among the first to reflect to the full the effect of cheaper coal; and consumers of gas and coke, both industrially and domestic, will, in their turn, rapidly reflect the benefit of the reductions.

I trust that I have not wearied you in my endeavour to touch upon a few subjects which are to-day of general interest and importance to most of us, leaving the special fields of modern gas engineering, such as "total gasification" to be covered by contributions from experienced members, with useful discussion. I also trust we shall be honoured during the year with offers of interesting papers.

Votes of Thanks.—Forthcoming Visits.

Mr. Shapley, in proposing a vote of thanks to the President for his very excellent address, said he was glad to hear his remarks about coke sales. They ought to take this matter up, not only from a commercial, but from a national point of view. He agreed also with Mr. Davies's references to gas. The one thing to be done was to see there was a regular pressure and no falling-off in quality. It was no use having a distributing staff unless that were done. Concerning gas engineers, he submitted that it was a wise policy to get the best men and pay them well. This, he said, was a thing to hammer at: Get the best men in, and then you can beat the electricity people into a cocked hat, with what we have seen to-day.

Mr. J. P. Leather (Burnley), seconding the proposition, spoke of the interdependence of the technical and administrative departments of the gas industry.

Mr. Samuel Glover (St. Helens) in supporting the motion, congratulated the President upon his address. As more or less a veteran in the gas industry, he had for many years watched Mr. Davies's progress; and when he saw he was in the line of progression for the office of President he was glad, and took the opportunity of congratulating him on the position he had established in Chesterfield.

Mr. Shapley put the motion; and it was carried with loud and prolonged cheering.

The President, appropriately acknowledging the compliment, remarked that, as to certain points in his address on which there might be disagreement, he hoped that opportunities for future discussion would be afforded. For example, the question of the purchase of coal. It was of prime importance to gas engineers. If they were united, they might get better value. With regard to the coming year, he mentioned the suggestion that a visit might be paid to the low-temperature carbonization works at Sheffield. Another visit might be to Chesterfield at a later date. There was something interesting to be seen at Chesterfield; and he would be pleased if the members would hear what his Chairman (Alderman Clarke) had to say.

Alderman Clarke said he would be glad if the Institution would visit Chesterfield. Members would be entertained to lunch, and everything would be done to make the visit a profitable one. He desired at the same time to say how pleased he was, as Chairman of the Committee under whom Mr. Davies served, to see him in the Chair of the Institution.

The President thanked Alderman Clarke for his invitation, and assured him the Council would give it careful consideration.

Mr. J. H. Brearley (Southport) moved a vote of thanks to the Council and to the Hon. Secretary and the Hon. Treasurer for their services. He emphasized in particular the services which Mr. Frith had rendered as Secretary for eight years, and took the opportunity of commending the proposal to set-up a central laboratory for the use of small gas undertakings.

Mr. H. Kendrick (Stretford) seconded the motion.

The President, in putting the motion, expressed regret that Mr. Frith was retiring from the Secretaryship. His regret, however, was mitigated by the fact that Mr. Frith was to be Junior Vice-President, and that Mr. Rogerson had consented to be Secretary.

The resolution having been passed with cheers,

Mr. Frith acknowledged the kindly things said about him.

On the motion of Mr. E. H. Hudson (Normanton), who thought an omnibus resolution such as the one just passed did not sufficiently appraise the value of Mr. Frith's past work, a special resolution of thanks to Mr. Frith was submitted. This was seconded by Mr. Brearley (Southport), and passed unanimously. It was, remarked Mr. Brearley, a good thing to have as Secretary a man who was invariably cheerful and who never got angry in the most trying circumstances. Such a one they had had in Mr. Frith.

Mr. Frith expressed thanks for this separate resolution, and for the kind words of appreciation.

THE CLARK "TRUCLIFT."

The use of small self-propelled trucks for transport purposes in and around industrial plants has made great headway during the past few years. For work of this kind the best type of truck is undoubtedly a self-contained unit, which will give the utmost flexibility in use, and be always ready for service. A novel truck which fully meets the above requirements is the Clark "Truclift"—a self-contained petrol-driven machine, which is being supplied by Messrs. Millars' Timber and Trading Co., Ltd., of Pinner's Hall, Great Winchester Street, E.C. The "Truclift" has the advantage that it is provided with a lifting platform, enabling the operator to load and unload the machine without dismounting, where goods are stored on suitable platforms. As the "Truclift" is under 3 ft. in width, it can operate in a narrow aisle. It will carry a load of 4000 lbs. up a grade of 11 p.ct. on low gear; and it will turn round an inner radius of 3 ft. This four-wheeled truck is built with a riveted channel frame, and is fitted with a four-cylinder petrol engine, with enclosed valves, high-tension magneto ignition, impulse starter, fixed spark, thermo-syphon cooling, and oil-circulating pump. The engine drives a two-speed gear of the planetary type, and a pressure-pump (for operating the lifting platform) by means of a roller chain. From the gear the drive is through a reverse-box and propeller shaft to the front or driving axle; the latter being bevel driven. The over-all reduction in high gear is a trifle over 5 to 1; and in low gear, 15½ to 1. The maximum speeds of the truck in either direction in high and low gear are six and two miles per hour respectively. The engine-driven pressure pump forces light oil into a lift cylinder working under a pressure of 240 lbs. per sq. in. when lifting a load of 4000 lbs. on the platform. The lift cylinder has a stroke of 6 in.; and it operates a series of lifting levers through a rack and gear segment. This lift gear will operate the 4000 lb. load from the minimum height of 11 in. above the floor to the maximum height of 16 in. in 8 seconds. The lift can be stopped at any point by the control lever. The truck brake is operated by a foot pedal on the running board; the brake being applied automatically when the driver removes his weight from the pedal.

Southern Association of Gas Engineers and Managers.—The general meeting of the Association to be held on Thursday, March 23, in the Connaught Rooms, Great Queen Street, W.C., will be preceded by luncheon at 1 o'clock. The business meeting will begin at 2.45; and after the report of the General Committee has been submitted, the new President (Mr. J. M. Campbell, of Margate) will deliver his Inaugural Address.

SCOTTISH JUNIOR GAS ASSOCIATION.

INFORMATIVE LECTURE ON PRESENT-DAY PROBLEMS.

There was a very representative attendance in the Royal Technical College, Glasgow, on Tuesday, Feb. 28, when, under the auspices of the Western District of the Scottish Junior Gas Association, a lecture on "Gas-Furnaces" was given by Dr. E. W. Smith, F.I.C. (Technical Director of British Furnaces, Ltd.).

Mr. James Cubie (the President), who was in the chair, said that Dr. Smith might rest assured they would not confine his lecture solely to gas-furnaces, but that they would welcome and appreciate his views on other topics connected with the industry.

Dr. Smith, whose lecture was enhanced by an attractive set of lantern views, remarked that he had been in the gas industry not more than fourteen or fifteen years, and to himself at all events his connection with the Junior Associations had been intensely interesting. The activities carried on by the Midland Junior Gas Association had always seemed to him of great value—indeed, he felt they could compare not unfavourably with the work of the most aggressive and energetic senior organizations. He was glad to think from the accounts that had been given him of the enterprise of the Scottish Junior Association that a similar compliment could not unfairly be paid to the Western District branch. After all, since coming to Scotland, he had decided to say very little about gas-furnaces. At all events, what he proposed to say on gas-furnaces would be reserved for the latter portion of his lecture. He had been largely influenced in this decision because he understood that the subject of gas-furnaces was not of engrossing interest to the majority of the members of the Western District. He thought, however, it would be useful and possibly informative to expand a little on the various points of general interest to the industry, because he had the feeling that many of the younger men present must be regarded as likely to be the mainstay of the future gas industry.

Touching on the importance of the gas industry and their responsibility as individuals to it, Dr. Smith said he questioned if there was an industry of greater importance, not only in Scotland but also across the Border. If they reflected for a moment, they would discover they had in gas an industry which was supplying the heat and light required in their homes, and which was responsible for the bulk of the power required for engines and for heating in the factories. Finally, and most important of all, they had the furnace which was given only by gas at a correct cost. It seemed to him that the one prime and essential need of the industry at the moment was efficiency. This could be best defined by saying that they should individually and collectively strive to make an accurate and thorough use of the material they had to handle. Coal they must always regard as the basis of their industry; and it did seem to him that efficiency lay in the proper utilization of coal. One outstanding advantage that he felt they ought to claim for gas was that, by the more extended use of it, they would reduce the smoke nuisance. Personally, he had the feeling that there was possibly more ill-health due to lack of sunlight than to any other cause. Of course, when he said sunlight he did not altogether mean complete sunshine. He had in mind principally the lack of that grade of sunlight so conducive to health. In so far, then, as they as an industry eliminated smoke, in so far were they making a contribution of something that was more conducive to the health of the community.

Passing on to discuss the question of individual responsibility, Dr. Smith urged that it should be the aim of every individual to do the very best he could in his job. In so acting, the individual would enlarge his responsibilities; and his stake in the industry would prove eventually to be greater and stronger. The impression he formed in the United States—he was there for a matter of six months—was that the so-called "American hustler" was just so much nervous strain and very little else. Frankly, he did not believe for a moment that this nervous strain carried them very far. Mere talk and action were not in themselves indicative or productive of results. To attain results there must be careful thought, consideration, study, and mature decision. From his own personal experience of the United States, he did not think they had anything to fear from their cousins on the other side. At the same time, he wanted to warn them that continuity of work was not the main essential. He regarded quality of work as of supreme importance. He did wish that fitters appreciated the importance of their calling—loss of efficiency in their department was bound-up with the success of the whole gas undertaking. If they were to gain the good opinion of the consumers, the fitters must ever work on the principle that one success was equal to a hundred mistakes. The gas undertakings throughout the whole of the British Isles had borne the brunt of much "bullyragging" during the years of war, but he felt these would survive. The future, however, lay with the youths of the industry—those who were probably under 25 years of age, and who were at the moment undergoing their training and absorbing the atmosphere of to-day. It was not the fitters alone who were to create the good impression in the industry. It was not even the men in all the various departments who were working with their hands. All sections and grades in the industry had to make a contribution towards the creation of that good impression. Finally, there must be personality and character.

In 1920, there was enacted a piece of legislation which was known as the Gas Regulation Act. The Act, as they well knew, had often been called the charter of liberty of the gas industry. For twelve months now the Act had been operative; and its provisions were gradually becoming more generally appreciated. To his mind, it was rather a misnomer to describe the Act as the charter of liberty of the gas industry—rather would he refer to it as the charter of liberties of the consumer. After all, it was a bit of useful legislation which was a charter to restrict the liberties that had been taken by the gas industry in the past. There was no doubt whatever that gas undertakings had more or less taken liberties with the construction and production of gas. The chief reason for this, he thought, had been almost entirely the lack of knowledge of the facts by the consumers. Things were done then because the consumer did not appreciate what was taking place. Nowadays, however, there was noticeable an increased knowledge on the part of consumers, and liberties could not be taken. There had been a controversy during the past five years as to what quality of gas they should provide. No doubt there were a good many systems of manufacturing gas in vogue; and it was not his function that night to settle the type and form of gas that was the most suitable for delivering on the premises of the consumer. Any competent engineer going round an individual district was capable of settling this question satisfactorily to all concerned after he had had (say) about six months experience of the district. In Glasgow, however, where, like other large centres and cities, distribution costs amounted in probably most cases to at least 33 p.ct. of the price which was charged to the consumer, it surely became as important to consider the cost of distribution as well as the cost of production. It would be very much cheaper to distribute heat concentrated than to distribute it diluted with water. In Glasgow, he had the feeling that it would be very injudicious to reduce the standard calorific value materially from what they had it now—say, 500 B.Th.U. He felt disposed to say they should not do it unless there was overwhelming evidence to show that there was an advantage in reducing the calorific value. He had the feeling that to reduce the calorific value considerably from 100 to 150 below 500 B.Th.U. would be to reduce the capacity of the distribution system. Their aims, as he saw them, ought to be to maintain a constant pressure, and to supply the consumer with gas at the lowest price.

On one topic of the moment he was anxious to offer a few reflections. He was strongly inclined to dispute the statement so freely asserted in the Press that a large number of deaths were due to gas poisoning. Everyone would agree that there was a tremendous number of deaths from accidents of various kinds; but with the increased use of gas, with a higher standard of intelligence on the part of the consumer, and with better supervision of fittings, he felt that the future would disclose a greater reduction in the number of deaths due to accidental gas poisoning than now. His own feeling on this question was this—that there were more cases of gas poisoning due to attempts at deliberate suicide than anything else.

Speaking of the importance of the industrial load in gas undertakings, Dr. Smith said that far too many gas concerns believed all that was necessary was simply to see to the superintendence of sales—like placing a penny in the slot and pulling out the industrial commodity. This would not do at all, and it was an insult to the industry to send out a man who did not know anything about his business. They must cultivate and look after the industrial load. In Birmingham in 1909, they were selling 100 million cubic feet of gas per annum. To-day the consumption had increased to 2500 millions per annum. This had been brought about partly through the exigencies of the war, but largely by catering for the industrial load and catering for it on an elaborate scale. The industrial man did not know anything—or at least not much to begin with—about the use of gas in an industrial concern; and it was absolutely essential that the gas department should have an engineer or engineer-chemist on the staff who would foster the sale of industrial gas. The supreme point of recommendation in an industrial gas salesman was an intimate knowledge of the requirements of those whom he was interviewing. For instance, if the salesman entered a galvanizing shop, he ought to be able to discuss with the manager the salient features in the process of galvanizing. The same intimate knowledge was necessary—indeed, of primary importance—in regard to cognate and widely different industries. The salesman they required for such work should be not only a trained engineer, but have a complete scientific equipment with a thorough knowledge of the fundamentals of chemistry and physics, including heat and magnetism. A knowledge of mathematics, too, was really essential.

On the subject of gas-furnaces, Dr. Smith contended that furnace practice had not received in the past anything like the attention it merited. At the moment, he was bound to admit that it was receiving a great deal of attention; but the results so far were not materializing. In regard to furnace construction, two main principles had to be kept in view. These were that the furnaces must be as efficient as possible in the use of gas, and that they should suit the requirements of the consumer.

At the close, Dr. Smith was warmly thanked on the call of the President.

Eastern Counties Association Spring Meeting.—The spring meeting of the Eastern Counties Gas Managers' Association will be held at Leighton Buzzard, on April 26. Members are asked to make a note of the date.

NEUTRALIZATION OF SULPHATE OF AMMONIA.

By T. Johnson, B.Sc.

At a Meeting of the Northern Section of the Coke-Oven Managers' Association held at Durham on Saturday, the 18th ult., Mr. T. Johnson, B.Sc., read a paper entitled "Notes on an Experimental Plant for the Neutralization of Sulphate." Mr. A. H. Thwaites (President of the Section) was in the Chair.

Mr. Johnson said that the sulphate of ammonia plant at Langley Park (co. Durham) was of the direct type. It was also so fortunately situated, by reason of the battery carbonizing nothing but dry coals and the shortness of the gas-main between the ovens and saturator, that for weeks on end in the summer months the saturator could be worked without the use of a superheater for keeping down mother liquor. From this it would be seen the steam consumption on the plant was very low indeed. Consequently, the method of neutralizing which was best adapted to it, and probably to any other method of sulphate recovery, was one in which the amount of liquor to be evaporated or otherwise worked-up was reduced to a minimum or, preferably, eliminated altogether. Extensive experiments were made at Langley Park in an endeavour to neutralize the sulphate by simply washing it with water in the centrifugal drier; but in no case was it possible to reduce its free acid content to 0·025 p.ct. with less than 2½ gallons of water per cwt., which would amount to a very large quantity of weak acid per day. Moreover, the contents of the centrifugal drier, as treated by that method, were found not to be uniform throughout in their composition. While portions of it were neutral, other portions of the same sulphate showed high acid content. For this reason the method was abandoned. The use of weak aqueous solution of ammonia was considered; but the capacity of the pot-still on the plant for working-up ammoniacal liquor was below what was necessary to produce the required amount of ammonia solution. Further, the effect of free ammonia in solution upon the copper in the centrifugal drier militated against the adoption of this method, which was also abandoned.

The question of providing sufficient ammonia by the decomposition of the sulphate of ammonia already made was next considered; but it was thought that, having once got the ammonia in the form of sulphate, it was undesirable again to break it up. They therefore experimented with the use of finely-divided alkali salts which, coming in contact with the free acids in the sulphate in its damp state, immediately after leaving the centrifugal drier, would bring about neutralization. Precipitated calcium carbonate was tried in the laboratory, and satisfied their requirements so far as neutralizing was concerned. The problem of finding a suitable machine in which to deal with the whole of their make of sulphate on a commercial scale was solved after a certain amount of experimenting with a concrete mixing machine. The machine was put into commission, and dealt with the material quite satisfactorily. They also endeavoured to dry the sulphate, before discharging it from the mixing machine, by blowing hot air through it, but were unable to reduce the moisture content to the desired figure by this method.

They then concentrated on finding a machine which would dry the sulphate at the same rate as it was discharged from the saturator. The merits of steam-jacketed agitators, plates heated from underneath by gas or otherwise, a stream of sulphate falling down a tower through which a counter stream of hot air or gas was blown, and other forms of drying were considered, but none seemed suitable. It was thought that the passage of a stream of hot air or hot products of combustion (horizontally) over a stream of sulphate would bring about the desired result, in the same way in which crushed road metal was dried and heated before being treated with tar for macadamizing. In their first efforts in this direction, a gas-jet was burnt directly over the top of a stream of sulphate travelling along the bottom of a length of 24 in. gas-main. This effort produced dense, white clouds at one end and large pieces of partly decomposed sulphate of ammonia at the other end. While this method was considered unsatisfactory, it did lead them on to the track of what appeared a solution of the drying question for them at any rate.

Instead of bringing the hot gases and the sulphate together in the method previously described, the gas-jet was removed sufficiently far from contact with the sulphate to ensure that dissociation would not take place. Staggered 3-in. angle-irons were bolted horizontally to the inside of a revolving tube on the plant in 3 ft. lengths, and the tube lengthened to the desired dimensions; and finally they were able to dry satisfactorily the quantity of sulphate required per shift. By the method adopted they were able to turn out sulphate of the following average composition:

Ammonia	25·4 p.ct.
Moisture	0·2 ,,
Free Acid	*Nil.*
Calcium sulphate	0·6 ,,

The amount of calcium carbonate used was 0·5 p.ct. of the weight of sulphate of ammonia dealt with. The calcium sulphate in the finished material, they were informed, was in no way injurious for agricultural purposes. Calcium sulphate, however, having some of the properties of plaster of Paris, gave a tendency towards the formation of lumps in the sulphate produced. For this reason, and having regard to the fact that the cost of soda ash was only about half that of precipitated calcium carbonate, soda ash was substituted and found to give equally satisfactory, if not better, results than calcium carbonate. The analysis of the sulphate so produced was practically the same, except that sodium sulphate was substituted for calcium sulphate. The soda ash used had the further advantage that its density was less than that of calcium carbonate. The bulk of soda ash necessary to neutralize a given amount of sulphate was therefore greater than that of calcium carbonate for the same purpose; and it resulted in much better contact with the ash. Several improvements had been made in their experimental plant since it was first set going; the internal rod of the internal combustion engine having been removed and a motor driving on to the crank shaft of the engine introduced.

A measured quantity of sulphate, as discharged from the centrifugal drier, was put into the mixer by means of a charging box. To this sulphate, while in motion, the requisite amount of soda ash was added. The ingredients were intimately mixed together for about ten minutes, after which the neutralized sulphate was discharged and fed into the drier by hand at the rate of about 6½ cwt. per hour. The drier made about 22 revolutions per minute, at which speed the sulphate was carried up by the angle-iron to the top of the drier, thence falling through the hot products of combustion issuing from the gas-burner at the discharge end of the drier. The drier was inclined at about 1 in 60. The motion of the revolving tube, together with the tendency of the angle of repose of the sulphate to decrease as the sulphate was dried, carried the sulphate forward to the discharging end of the tube, after which it passed over a small screen which took out any lumps over ⅛ in.; the fine sulphate passing through the screen into a bag on the movable carriage beneath. The main features of the process were that neutralization took place in an open vessel, and that the drying was a separate operation carried out in another piece of apparatus and subsequent to neutralization. The sulphate was filled directly into bags.

The amount of gas required for drying had not been measured, but was less than what would pass through a 1 in. diameter pipe at about 3 in. water gauge pressure. The gas-flame was regulated so as to maintain a temperature of 300° C. at a point on the horizontal portion of the combustion chamber. In order to ensure, further, that the sulphate should not come directly in contact with the hot gases while they were yet at a temperature sufficiently high to bring about decomposition, no angle-irons were put in for a length of about 5 ft. at the discharge end of the tube, and the drying which took place in that part of the tube was only what was brought about by contact with its shell as the sulphate passed along the bottom.

The temperature of the sulphate leaving the drier was about 70° C. The man operating the plant from time to time squeezed a portion of the sulphate as discharged from the drier in his hand, and could tell approximately by its appearance after pressure whether or not it was sufficiently dry. If there were any tendency to cohere after compression, it was not dry enough. If there was no such tendency and the sulphate passed freely out of his hand under compression, so far as they could see at present there was no danger of the sulphate forming lumps in the bags. Recent laboratory experiments had shown that with under 0·4 p.ct. of moisture content in the sulphate, when either calcium carbonate or soda ash was used, there was no tendency to form lumps even under a pressure so high as 110 lbs. per sq. in. Above this moisture content, cohesion became pronounced.

The products of combustion, together with the moisture from the sulphate and pyridine, were carried away from the drier by means of an overhead hood and chimney arrangement; and there was little or no smell as a result. The number of men required to work the neutralizer and drier was one per shift. His duty was to neutralize, dry, superintend bagging, weigh, and sew-up the bags. The output was about 6 tons per day. Unless some means could be found by which the sulphate could be more cheaply and satisfactorily dealt with than by the method described, it was proposed to rearrange the plant in such a way that the man operating it would be relieved of practically all shovel work, which would enable him to perform duties other than those of attending to the neutralizer and drier.

They did not consider that they had overcome any great chemical or engineering difficulty; but they had, they thought, succeeded in fixing up a plant which would neutralize and dry the whole of their make of sulphate of ammonia satisfactorily and cheaply. They had for several weeks neutralized the whole of their output by this method, and sent out several 100-ton orders in excellent condition. Mr. T. Westthorp had played a prominent part in the experiments in connection with the plant, and had been of great assistance in bringing them to their present stage.

DISCUSSION.

The President said the paper had been very interesting and valuable as one which concerned them all very much at the present time, as every plant would be faced with the fact that they must make the neutral salt. To his mind, the plant described by Mr. Johnson appeared to be the most practical he had seen or heard of. So far as he was concerned, he was bound to say that after considering the question carefully, he had not as yet come to any definite conclusion, but was rather waiting for a plant which would do the whole three operations of neutralizing, drying, and grinding in one. The machinery he had seen had been rather disappointing in some respects; so they were inclined to hold on until there was a plant combining the three operations satisfactorily.

Mr. A. E. F. KNOTT said that the paper had come at an opportune moment. The time was coming—or had come—when it would be as much a sin to send out the product containing moisture and lumpy portions as it was to send out benzole containing water and rust. They had made several experiments, including a revolving barrel turned by hand, and introducing ammonia from the stills. The results, though good, were not a practical proposition. Their experiments with the whizzer were not successful, nor were the experiments with the spraying of weak liquor. What he did consider was the thing, was the combined neutralizer, grinder, and drier known as the "Cordite" mixer, or some adaptation of that type. He had seen the machine at Sheffield, and the whole process carried out. He expressed much satisfaction with it, and said he was greatly impressed by the results.

A discussion took place on the commercial aspect of the production of neutral sulphate, after which

Mr. GUY STEPHENSON asked whether the salt which Mr. Knott had seen absorbed moisture in storage.

Mr. JOHNSON remarked that they had made certain experiments in this respect, but were not yet in a position to give definite data. Generally speaking he thought it was admitted that all salts in storage had a tendency to absorb moisture to a greater or less degree.

Mr. MORDECAI said he had been interested in hearing how Mr. Johnson had solved the problem in his particular plant; but they should remember that conditions varied very greatly—so much so that what might cure at one place would do nothing at another. Still, he was of opinion that the chemical engineering difficulties in the question had been much exaggerated. Much greater problems were being successfully tackled every day in the fine chemical industry. In most plants it was an individual question of finance. He believed that in 99 p.ct. of the plants an expenditure of money to-day would solve the problem. He thought the process which would ultimately suit all people would be one in which, in one section, they would have neutralizing with ammonia gas, drying with hot air, grinding, and direct filling—the whole thing being inclusive. There would also be an attempt to recover pyridine.

Mr. A. H. MIDDLETON pointed out that with regard to the plant described in the paper, the use of the term "grinding" was somewhat of a misnomer. Some might consider that grinding was a necessity; but it was quite unnecessary as a separate operation in that case. The action of the mixer in that plant, and the passing down the funnel through which the hot air was passed, was quite sufficient to keep the crystals in their proper form, and no subsequent grinding was required at all. There were only two operations, and everything was performed at once. It would be quite possible eventually to perform the work satisfactorily in one operation, and to have the sulphate discharged from the mixer to the drier. The machine was much more simple than it appeared from the drawings shown. It was easy to make, and dealt with the whole of the output simply and satisfactorily.

Mr. JOHNSON added that recently they had not been getting quite the same percentage of arsenical acid, and the salt had been much whiter as a result. The salt they were turning out at the present time was practically white; and he thought this was due to the reduction of the percentage of the arsenical acid.

Mr. J. CURRY said that his experience was that temperature of the gases had a great deal to do with coloration—the higher the temperature the darker the salt.

Mr. MIDDLETON expressed the opinion that headway was being made against the colour prejudice. Ninety per cent. of the salt was for agricultural purposes; and if they could suit that trade, they would strengthen their position in competition with other kinds of artificial manures.

A vote of thanks was accorded to the reader of the paper.

Astoria Company's Works.

In connection with a very clear air-plane view of the works of the Astoria Light, Heat, and Power Company's extensive plant at Astoria (L.I.), "Gas Logic" gives a few particulars of this immense undertaking. In the foreground are seen the two gas-holders, each having a capacity of 15 million c.ft., and both of which are now in use. [A photograph of the inauguration of one of these holders by the late Mr. William H. Bradley will be found on p. 495 of last week's "JOURNAL."] The two coal-gas retort-houses are 489 ft. and 542 ft. long respectively. One is 141 ft. wide, and the other 125 ft. wide. The water-gas generator house is 362 ft. long, and, with an extension of the same size, has a length of 724 ft. in all. This Astoria plant is connected with the Bronx at Port Morris by a tunnel, which is 4662 ft. long. The bottom of the tunnel is 264 ft. below the low-water mark of the East River. The top of the tunnel (which is 19 ft. in diameter) is 245 ft. below the low-water mark; so that the top of the tunnel is many feet below the bed of the river. The shafts at both ends of the tunnel are 234 ft. in depth. In this tunnel there are two gas-mains, each 6 ft. in diameter; and through them the gas is carried from Astoria to the Bronx, and thence throughout the boroughs of Manhattan and the Bronx. The Astoria works are capable of manufacturing 86,000,000 c.ft. of gas a day. It was at the Astoria plant that sufficient toluole was manufactured during the last year of the war to load 10,672,480 shells. Some 70 p.ct. of all the T.N.T. produced in the United States was made at the Astoria works. More than 90 p.ct. of the carbon granules made for the Chemical Warfare Service for use in gas masks, to absorb poisonous gases, were also made in the works of the Astoria Light, Heat, and Power Company.

Southern Association of Gas Engineers and Managers (Eastern District).—The next meeting of the Eastern District of the Association will be held at No. 28, Grosvenor Gardens, S.W., on Wednesday, March 29, at 2.30.

SOCIETY OF CHEMICAL INDUSTRY.

MANCHESTER SECTION.

INORGANIC CONSTITUENTS OF COAL.

At a meeting of the Manchester Section of the Society of Chemical Industry, on the 3rd inst.—Dr. E. Ardern presiding—a paper entitled "The Inorganic Constituents of Coal, with especial reference to Lancashire Seams," by Captain F. S. SINNATT, M.B.E., M.Sc.Tech., F.I.C., &c., and Mr. N. SIMPKIN, M.Sc.Tech., A.I.C., was read by Captain Sinnatt. The authors of the paper stated that the investigation of the inorganic constituents of Lancashire coals was being continued; and the present paper was concerned with the examination of the modes of occurrence of iron in certain of the coal-seams. The work had been carried out under the auspices of the Lancashire and Cheshire Coal Research Association.

In a paper previously read before the Section by Messrs. Bayley, Grounds, and Sinnatt, it was shown that the plates of inorganic material (ankerites) found in coal-seams were derivatives of calcium carbonate in which a proportion of the base was replaced by iron (ferrous), magnesium, and manganese. It is known that the ankerites undergo oxidation on exposure to air, and that this phenomenon is a factor influencing the disintegration of the masses of coal during storage. It was suggested in the previous paper, and by several speakers in the discussion which followed its reading, that the ferrous iron and manganese might be of importance as agents leading to the spontaneous heating of coal, whether in the goaf or during storage. The present results, it is thought, may have a bearing upon the behaviour of the ash found when the coals are burned, and may be of value in furthering the discussion upon the influence of the oxidation of the iron present upon the incipient heating of coal.

The work mentioned in the paper largely followed the lines described by Powell, except that additions can now be made to the number of types of iron that he differentiates. Powell distinguishes four forms of iron as occurring in the coal substance, and submits figures for the iron occurring as water-soluble iron, iron soluble in hydrochloric acid, iron occurring as pyrites, and that present in the form of silicate. In the portion soluble in hydrochloric acid, he made no attempt to differentiate between the iron occurring in the form of ankerites and that present in the mass of the coal in other combination. The amount of iron occurring in the form of ankerites in certain specimens of coal is by no means negligible; one sample examined, in which 4·2 p.ct. of ash was present, being found to contain approximately 1·7 p.ct. derived from ankerites. The subject of the different types of iron pyrites is at present being exhaustively investigated microscopically by Mr. J. Lomax, of Bolton, who has already described a number of distinct forms.

The analytical values of three specimens of pyrites were then stated, with a view to showing that their composition is variable, and that, in addition to iron pyrites, they may contain iron in the form of carbonate. The extraction of iron by water was of some interest in connection with the water in mines. This water contains the iron in the ferrous condition; and in a recent heating which occurred in one of the pits observed by the authors of the paper, large crystals were found in one of the masses of coal when the heated zone had been cooled, which, on examination, proved to be practically pure ferrous sulphate. Iron occurring in the white partings, or ankerites, will readily pass into solution on treatment with acid; but, in view of the fact that many specimens of pyrites which occur in coal contain iron in the form of ferrous carbonate, it is clear that there are at least two sources from which the iron soluble in hydrochloric acid may be derived. Attempts had been made to determine the percentage of ankerites in coal, but without success.

The third part of the examination conducted by the authors of the paper consisted in the determination of the iron disulphide present in the samples by the method suggested by Powell. The details of the experiment having been mentioned, Captain Sinnatt stated that the residual coal was dried and ignited, and the ash carefully examined. It was found that the ash from the majority of the coals examined possessed a faint creamy colour; but three of the coals left a residue which was entirely free from iron. These prove conclusively that nitric acid completely extracted the whole of the iron from the coal. The results confirmed those of Powell.

Iron in coal may occur in at least five distinct forms—namely, in the ankerites, in ferrous carbonate, soluble iron salts, silicate, and as pyrites. Results of an investigation of the temperature of decomposition of ankerites were stated in detail.

Société Technique.—We have to acknowledge with thanks the receipt of the official report of the 44th Congress of the Société Technique de l'Industrie du Gaz en France, held at Tours last June. The report takes the form of a well-bound volume of 572 pages, and is a valuable record not only of the business proceedings and of the Society's members and their stations, but of the technical "*commission*" work and the papers submitted at the Congress. The latter comprised the reports of three sub-committees—on Gas Making, Appliances, and Technical Training—and seventeen papers by leading men in the industry. Ten of these communications were abstracted in various numbers of last year's "JOURNAL," Vol. CLV.

SIDELIGHTS ON SELLING GAS.

By Norton H. Humphrys.

I.—The Attractions of an Agreeable Personality.

In the ordinary course of business, the manager of a gas undertaking will meet, or be in association with, his chairman and board of directors, also other chairmen, directors, or managers of gas undertakings; with his own and with other employees; with gas consumers existent and prospective; and with that extensive and useful class of the community generally known as commercial travellers. When reflecting upon the various tactics and methods adopted towards securing the desired objective, either in the way of buying or selling, which are comprised under the colloquial expression "doing business," he cannot fail to be strongly impressed with the important position taken by a pleasing and agreeable personality, a natural and not artificial compound of good health, good spirits, sympathy, imagination, and last, but not least, a genuine sincerity. There must be entire confidence, not only in himself, but in his objective. To state examples would be invidious; but readers can readily fill in the blank from their own personal experiences, with illustrations of men known as general favourites, both in and outside the profession, for whom an abbreviated christian name is substituted for the formal "Mr.," and who have consequently attained a success in business beyond that proportioned or to be accounted for by qualifications in the way of brains or ability.

The old customs of a glass of wine or a luncheon over a bargain have disappeared to a great extent; but the personal element, and the combination of business with pleasure, perhaps in a more refined form, will always be with us. The absence of an agreeable personality in connection with sales of gas is therefore a strident defect, none the less so because many, with the assistance of absence of competition or other advantageous circumstances, have been able to make quite a respectable showing without it. Customers know their butcher and their tailor; and the gas company suffers, both in prestige and in business prospects, by the lack of similar personal knowledge. The unknown is always subject to distrust. The gas company may comprise one or two wealthy individuals who never come near the place, or be represented by a syndicate carrying on business in an adjacent important commercial centre, who may control its affairs by the means of an absentee directorate. If there are resident directors, the position may not be much better, as they are sometimes appointed simply as the personal or representative owners of a substantial part of the whole. In that case, they are watch-dogs rather than live wires, having no sense of duty beyond the mere cutting-down of expenses. Questions of broad development on the lines of public service are beyond their ken. They have no special qualification for the control of an undertaking, no interest in the uses of gas, and perhaps at the back of their minds but little faith in it. The Lilliputian amounts of the directorial domestic accounts for gas consumed, as compared with the face value of the directorial dividend warrant, are a source of amusement in the offices. They never recommended gas or secured a customer in the course of a lengthy career. This line of action steadily filters down to those in actual association with the customers. Such showroom and selling arrangements as may be in existence are a weak-kneed misfit with no backbone; and the average consumer would almost as soon go to the dentist as call at the gas office.

The gas company are represented by a quarterly visit from the meter inspector, and one (possibly more) from the collector. These officials, having a monotonous job and being expected to make up a fixed quota of "calls" per day, are not under conditions favourable to the development of an agreeable personality, but are apt, quite unintentionally, to acquire a demeanour that tends to the opposite direction. A discussion about the gas supply, or even inquiries that might lead up to a desirable extension, are cut off with a curt "Go to the office." The advice is rarely acted on, except in a case of life and death. Examples are on hand of officials who would even refuse to accept a complaint or an order. The same atmosphere may extend to the meter changers or complaint fitters. Frequently a stimulating cause is lack of encouragement at headquarters. The periodical visitors are not impossible of improvement; but the inspiration must come from the fountain head—and, more than that, the means of sustaining it.

An employee remunerated at bare market rate, and treated in the office or workshop as a machine rather than as a man, is more likely to study ways and means of getting through the prescribed number of calls with the least possible expenditure of time and trouble than questions that are not even mentioned at headquarters, and is not likely to be more popular in the district than an income-tax collector.

The routine work must of necessity be arranged on a time schedule covering a fixed district per day, to the exclusion of other considerations; but a little tact at headquarters would minimize this feeling, though opportunity is at best somewhat cramped. Yet the assistance of the periodical visitors in the work of facilitating progress towards the selling department is not to be despised.

The larger share of the work indicated in the title to this article comes into the salesman's province. In addition to the necessary technical knowledge of the leading properties of combustible gases, its distribution, and of the principal patterns of gas appliances, he should have a wide acquaintance with all selling methods. He is a buyer, if of nothing more than personal necessaries. Let him trace out the procedure that attracts him to a particular establishment and induces him to repeat the visit. An important feature will be that environments are congenial, and that the purchase is a pleasure rather than a bare duty. Glance at one of the gigantic emporiums for which London is famous. Quality and price are undoubtedly the real attraction; but why are they supplemented by hospitable conveniences such as rest rooms, instrumental and vocal music, and high-class restaurant service at low price, if not as a form of agreeable personality, which can be made evident in many impersonal ways? It should be studied not only as a means of satisfying and retaining existing custom, but also of attracting new business.

The salesman should have a voice in the showroom arrangements, and be encouraged to collect and report on every item that indicates the openings for business in the district. It is not enough to wait with a smiling face behind the counter. Like Hotspur's "spirits of the vasty deep," customers cannot be depended upon to come to business because they are called. He must follow the trend of modern trading, and cultivate attractive influences that will compel them to come in. And we must not forget that he will tend to the development of qualities, good or bad, that are favoured by the head of the department.

Gas for Banana Ripening.

Further testimony to the efficacy of gas for the purpose of ripening bananas is to hand from the United States. There gas has been found to accomplish this ripening process in less time than the old methods took to do so. The fruit arrives in a green state; and therefore steps have to be taken to ripen it for consumption, though frequently these means amount to the simple process of hanging it in the open air—which often results in spoilage. In one of the towns supplied by the Public Service Company of Northern Illinois, gas has been brought into service for this drying process. Bananas to arrive properly and naturally at the condition of healthy ripeness require a warm, humid atmosphere. The element of dampness in particular is requisite. In the case of the installation referred to, it is found that, if they are hung in a room warmed by a few open gas-burners, the necessary conditions are supplied. The burning gas furnishes the heat; and as one of the products of its combustion is moisture, the latter essential is thus contributed also.

Gas-Engine at Apedale.

Prefaced with the remark that of late years gas-engine design has materially improved, and the question of a suitable fuel supply has also received full consideration, so that to-day stand-by units are no more necessary than would be the case with a steam-driven plant of the same capacity, the "Iron and Coal Trades Review" describes the gas-engine installations at the Apedale works of the Midland Coal, Coke, and Iron Company, Ltd. The power station at the coke-ovens was designed to accommodate seven gas-driven units, or a total of 4200 B.H.P. The units at present in operation comprise four "National" eight-cylinder four-crank vertical engines developing 600 B.H.P. The surplus gas from the coke-ovens, after passing through the bye-product plant, flows through an automatic pressure valve, which closes if the pressure on the surplus gas-main falls below a predetermined figure. The valve on the discharge side is connected to the gas-main on the suction side of a Bryan-Donkin booster. There are two of these boosting sets, either of which is equal to dealing with the whole of the surplus gas from the 82 ovens, and boosting-up the pressure to 14 in. From the purifiers, the gas enters a holder, which not only ensures a constant and regular pressure to the engine supply mains, but acts as a mixing tank to mix thoroughly the gases of varying heating values. A recording calorimeter indicates any change in the heating value of the gas; and a meter measures the consumption of the station. The varying gas consumption is controlled by an automatic valve placed between the suction and discharge mains of the boosters, and actuated through a pressure control valve operated by the gasholder. This is a feature which has an important bearing upon the smooth and efficient running of the engines, as it enables them to run under varying load conditions with the gas and air valves in the full-open position, without attention from the man in charge. When in 1913 it became necessary to provide blowing plant to meet the additional demands of the blast-furnaces, the Company had no hesitation in deciding upon the installation of gas-driven units; and it was decided to instal four gas-driven units, the order for which was placed with the National Gas-Engine Company. Of this plant, our contemporary also furnishes a description.

National Gas Council's Removal.—The National Gas Council of Great Britain and Ireland have now removed to No. 30, Grosvenor Gardens, London, S.W. 1. The new telephone number is: "Victoria 6700, -1, -2, -3;" and the telegraphic addresses are as follows: National Gas Council—"Natgascil, Sowest, London." Federation of Gas Employers—"Fegasemps, Sowest, London." The National Joint Industrial Council for the Gas Industry—"Joicindgai, Sowest, London." All interviews will in future take place at the above address.

INDUSTRIAL LIGHTING.

Ideal Requirements (Legislative and Otherwise), and Practical Solutions.

At the Meeting of the Illuminating Engineering Society, on Tuesday last week, at the Royal Society of Arts, Adelphi, W.C., Mr. L. GASTER opened a discussion on the above subject. The following is a summarized account:

In his introductory remarks, Mr. Gaster said it is generally admitted that great advances have been made during recent years in our knowledge of industrial lighting requirements. The introduction of simple instruments for measuring illumination has given us an insight into the values of illumination customary in different factories. Researches have been conducted into the causes of glare and its prevention, the best ways of eliminating troublesome shadows, and the special requirements of certain industrial processes.

These advances paved the way for the preparation of official recommendations, such as those contained in the first report of the Departmental (Home Office) Committee on Lighting in Factories and Workshops in this country (1915), and supplemented in the second report issued last year (1921). In the United States there are now seven codes of industrial lighting in existence, all based on principles commonly accepted by experts.

IDEAL REQUIREMENTS.

The natural course is, first, to form some conception of ideal factory lighting; and, secondly, to see how far such conditions can at present be obtained in practice. Ideal industrial lighting can only be very broadly described. It should be such as to enable work to proceed at night with the same ease and convenience and safety to workers as exist under the best daylight conditions. Indeed, in view of the variability of daylight, one might conceivably attain even better conditions in certain cases. General experience, aptly summarized in the above reports of the Home Office Departmental Committee, indicates that for ideal requirements there are four main conditions to be satisfied: (1) Sufficient illumination. (2) Constancy and uniformity of illumination over the working area. (3) The placing and shading of lights so that no inconvenience and prejudicial effects are experienced from "glare." (4) The placing of lights so as to avoid inconvenient extraneous shadows on the work. There will naturally also be special conditions to be fulfilled arising from the peculiar nature of any industrial process; and a form of illumination that is ideal for one process may be less satisfactory for another.

PRACTICAL POSSIBILITIES.

In order to approach "ideal" requirements, we must first be able to define them; and although we have gone some distance in this direction, it will naturally take time before they are completely understood in all industries. The best course is perhaps to group together certain industries, having broadly similar requirements, to study them in detail, and to see how far this experience applies in other cases. Hence, the Departmental Committee acted wisely in first concentrating attention on the engineering, clothing, and textile industries. In aiming at securing sufficient light, we must distinguish between the illumination necessary in the interests of safety and freedom from accidents, which has already been specified in the Departmental Committee's first report, and the illumination necessary for carrying out efficient work, which is a much more complex matter. Here again the Committee first dealt with the most urgent and readily practicable problem. In the American codes it is customary to specify a minimum working illumination for rough, medium, and fine operations—figures ranging from 1 to 5 foot-candles being mentioned.

How, it may be asked, can we ascertain what working illumination is requisite? The most convenient plan is to collect statistics of prevailing values in existing factories. This tells us what is practicable and usual, but not necessarily what is best. A more scientific method is to experiment with different illuminations, asking the workers to state when they consider the illumination sufficient for their needs, and to indicate when the light is diminished to a point where they begin to find trouble in doing their job. One might supplement such tests by records of output under varied lighting conditions. This has recently been done in Chicago, with the result that in some factories better illumination led to increases in output of 8 to 25 p.ct., while in others, where the original conditions were very bad, increases of as much as 30 to 100 p.ct. were noted.

It is evident that the collection of such data means a considerable amount of work. When we come to consider closely other factors, such as the avoidance of glare, complex problems are again met. If a simple test of glare could be devised, the problem would be easier. One point has been impressed on all who have had experience of illumination researches. We must consider as a whole the various factors necessary for ideal conditions. The provision of a very high illumination will not suffice if other prejudicial elements such as glare or troublesome shadows exist. There is thus room for further study to determine "ideal requirements" in factory lighting. But enough has been said to show that we have already learned a good deal, and the mere fact that we can now express our needs and outline the things we have still to learn, shows that we have progressed.

LEGISLATIVE REQUIREMENTS.

It is a tribute to the progress made in the study of industrial lighting, and to the sympathetic and enterprising attitude of the Home Office in this country towards the problem, that the introduction into the Factory Acts of statutory provisions—(1) requiring adequate and suitable lighting in general terms in every part of a factory or workshops; (2) giving power to the Secretary of State to make Orders defining adequate and suitable illumination—has already received attention. Needless to say, legislative measures require very careful consideration, and one might justly hesitate to legislate on many matters, on which recommendations can confidently be made. Any form of "code" must be such that it can readily be enforced by those charged with the duty, and will actually prevent the most serious abuse of industrial lighting, and yet impose no hardship on the manufacturer. If too exact and detailed, it becomes difficult to enforce intelligently, and becomes a source of annoyance to the manufacturer. If too vaguely worded, its interpretation may give rise to troublesome differences of opinion. One's aim should be to produce measures which are necessary alike to employer and employee, as being for their benefit and which aid the manager in his duty of providing proper illumination. Above all it is desirable that official information should be generally understood.

THE SECOND INTERIM REPORT—THE RECOMMENDATIONS.

The first report of the Home Office Committee recommended certain values of illumination, ranging from 0·05 foot-candle in open places up to 0·4 foot-candle in foundries, as desirable in the interests of convenience and safety, in view of the relation clearly established between inadequate illumination and the prevalence of accidents. The question of "working illumination" has not yet been completely dealt with, although it is understood that much useful information has been compiled, and that suitable values will be ultimately agreed upon by consultation with the representatives of the industries concerned.

The second report makes general recommendations on "shadow" and "constancy"—viz., that "adequate means shall be taken to prevent the formation of shadows which interfere with the safety or efficiency of any person present;" and that "no light sources which flicker or undergo abrupt changes in candle power in such a way as to interfere with the safety or efficiency of any person employed shall be used for the illumination of a factory or workshop." It also contains the following recommendation on the avoidance of glare:

> Every light source (except one of low brightness) within a distance of 100 ft. from any person shall be so shaded from such person that no part of the filament, mantle, or flame is distinguishable through the shade, unless it be so placed that the angle between the line from the eye to an unshaded part of the source and a horizontal plane is not less than 20°, or in the case of any person employed at a distance of 6 ft. or less from the source, not less than 30°.

The application of this recommendation would doubtless remove the worst examples of glare. Yet it imposes no hardship, as it can be readily complied with in various ways. Thus, sources adequately shaded by diffusing glass or vitreosil glassware could be used anywhere in a workroom. Reflectors with a "cutting off" angle of 20° could also be used in practically any position. Even lighting units with a mantle or filament located below the edge of the reflector can be used high up provided they fall outside the specified 20° angle. The recommendation does not attempt to impose ideal conditions. It is a compromise, but should have a salutary effect.

Having dealt with the American codes, Mr. Gaster referred to

FUTURE LINES OF INVESTIGATION.

He said that statutory regulations on industrial lighting should be supplemented by unofficial action by societies such as the Illuminating Engineering Society. Many bodies could render valuable aid; and the British Industrial Safety First Association is already doing so. Detailed information on the best methods of lighting for various industrial processes are best arrived at by conference and research with representatives of the industries concerned, in which both employers and employees should take part. A precedent in this direction is set by the valuable work of the Industrial Fatigue Research Board, whose second annual report contains a section emphasizing the influence of good illumination on output, as illustrated by researches in the silk industry. The writer would like to take the opportunity of referring to the valuable work of Mr. D. R. Wilson on behalf of the Board.

INTERNATIONAL PROCEDURE IN REGARD TO INDUSTRIAL LIGHTING.

Industrial lighting is now receiving attention in various countries, and interchange of views is most desirable, in order that any recommendations may be based on commonly accepted general principles. A useful step in this direction was taken by the appointment, at the first technical session of the International Illumination Commission last year, of an International Technical Committee to review the whole subject. Ultimately it is to be hoped that an "International Code" on industrial lighting may be framed.

The paper was accompanied by a large number of excellent lantern slides, illustrating good gas and electric lighting in various classes of factories.

Review of the Discussion.

Mr. J. Eck, who presided, commented in a complimentary manner upon the great amount of interest the paper contained, as well as upon the photographs of typical lighting.

Data Wanted to Determine Adequate Illumination.

Mr. D. R. Wilson (of the Industrial Fatigue Research Board) congratulated Mr. Gaster upon covering such a wide field in a few words. His own remarks he confined almost exclusively to the work of the Committee of which he and the author of the paper are members. Touching the second report of the Committee, which dealt with factory lighting, he said it was a somewhat insignificant looking document; but he thought neither appearance nor price gave any proper indication of the value of its contents. To his mind, the report was extremely far-reaching in its effects. He asked illuminating engineers to read the report carefully, and to let either the Committee or the Home Office know their candid opinion of the recommendations before any further steps were taken in the matter. It was not until it was proposed to give recommendations of this kind statutory force that criticism came in, but then it was much too late. Regarding the side of their work as to the adequacy of lighting for different industrial purposes, the Committee were on the eve of considering a report on this important question. Without committing any other member of the Committee, he would like to give his personal views on the matter. It seemed to him that for the proper study of the adequacy of illumination, a great deal more work was required than had been done up till now in the way of fundamental research. He regarded the American codes as rather rough-and-ready approximations; and for a conclusive study of these questions, in his judgment physiological and psychological research, on groups of processes closely allied to each other, should be undertaken in the near future. Collateral observation should also be undertaken in industries regarding practices obtaining at the present day. He asserted that, before anything definite could be said as to the adequacy of illumination for any process, many years' work would have to be undertaken. The Committee which he represented was a small centralized body; and it was suffering from lack of funds. To obtain sufficient observation data would require considerable sums of money if one covered the whole industries of the country. It was clearly shown that illumination was closely related to production and safety. It affected both employer and worker. It affected also industry. If this was so, what was to prevent industries collecting the data themselves? Many industries had Research Associations and Industrial Boards; and he saw no reason why through these bodies industries should not set about the task of obtaining by measurement data of existing lighting practice. The fundamental study ought to be in the hands of a central body, like the Factory Lighting Committee, composed largely of scientific men. This was the only avenue he could see for the settlement of the question of adequate illumination. One of the illustrations shown by Mr. Gaster was a chart which indicated that the percentage cost of illumination was only 0·3 p.ct. of the total production costs of a factory. He did not know whether these were pre-war figures; but he did know that in certain industries, such as the silk industry, the cost of lighting was a very considerable item. This simply bore out his argument that one ought to study these questions very intensively. Of course, he could quite believe that in some cases illumination might err on the side of prodigality.

Ophthalmic Surgeons' Belated Consideration.

Mr. F. Herbert Fisher (Ophthalmic Society) said, in regard to the question of illumination, ophthalmic surgeons themselves, who ought to have settled their own requirements long ago, had only quite recently taken it into consideration in this country. But they had now arrived at a standard of illumination which they considered was essential for the purpose of sight-testing; and they had done this by the help of Mr. Gaster. It was not surprising, when ophthalmic surgeons were so far behind in this matter of illumination, that the captains of industry in the country had not considered the interests of their workpeople in this regard. It was to the interest of industries to provide sufficient illumination—a sufficiency which would not be detrimental to the workpeople, and which would increase production and decrease the production costs. As to the question of a scientific standard of illumination which might be required for any particular industry, this was an extremely important question, and one in which ophthalmic surgeons might collaborate with illuminating engineers. But they had to bear this in mind: There were a large number of people employed in the industries; and there were a great number of differences of eyes and eye ages. A light that would not be detrimental to a man of 25, to a man of 45 might prove to be quite inadequate; and his output and the character of his work might be impaired by insufficient illumination, the quantity of which, however, might be quite sufficient for another man. In settling such points, ophthalmic surgeons might be useful, as they might investigate the acuity of the vision of workmen.

Standardization and Lamp Changes.

Mr. W. R. Rawlings said he was attracted by a statement made by Mr. Gaster with reference to the standardizing of the reflector, the holder, or its position and the lamp. He thought much good would be done if the British Standards Committee could introduce a standard of lamp in relation to the angle of the reflector. It was a common thing to find installations of lamps with shades or reflectors that were good at the start; and then after a few months the whole aspect of the lighting was altered through the change in the lamps themselves. He also thought that perhaps illuminating engineers were a little too advanced in their technical terms; and if they could be simplified, it would be very beneficial from the public point of view.

International Collaboration.

Mr. J. W. T. Walsh (National Physical Laboratory) only wished to refer to one point (which he supposed they all realized)—the enormous amount of research which must be undertaken before any illumination values whatever could be fixed for adequate lighting in any particular industry, or for any particular kind of work. It was in this connection that he should like to allude to Mr. Gaster's statement as to the International Commission on Illumination. Last summer that Commission set-up an International Committee to study this very question of factory lighting; but Mr. Gaster did not tell them that he was the British delegate on that Committee. He (Mr. Walsh) felt sure that the time necessary for them to arrive at some idea as to the adequate amount of illumination would be greatly shortened if they could co-operate with other countries in the matter—if they could pool their data and their researches. It was with this in view that he should like to appeal to the members of the Society to communicate to the International Committee any measurements they might make themselves, or to which they had access. He was perfectly sure that any information of the kind would be of value to the Committee; and it would represent a very big step forward in their work—a far bigger step than if the Committee had to do all the work themselves. The Home Office Committee had put this country in the forefront so far as experimental work on this subject was concerned; and it was up to those interested to see that the country was kept there.

Illumination Prodigality a Danger.

Mr. P. G. Waldram said he was interested in the American data, which represented, he thought, very high values indeed for lighting purposes. In his opinion, there was great danger indeed of having unduly high values; and considerable discredit was thrown upon research by those values in the eyes of people who knew they could get on quite well with something less. Although lighting might represent a small part of total production costs, yet even the small items were of considerable importance—in fact, the smaller the item, the more often it attracted the attention of the works manager. If they recommended high values without comment, there was very considerable danger of much good work becoming unpopular with practical people, who, it had to be borne in mind, had the last say in the matter—they being the owners of the factories. The American figures should be very closely examined to see whether they did represent careful research, or whether they merely expressed the views of engineers who were possibly interested in the sale of the illuminants themselves. In his view prodigality in general lighting specifications was a great danger. In regard to office lighting, 2 and 3 foot-candles were regarded as the minimum. He had had a large number of offices to examine, and the number of them that had below 2 foot-candles was surprisingly large, and so were the number of people who worked with an illumination of under that value. If they were to raise office lighting which was under 2 foot-candles to some higher value, it would mean a vast expense in reorganizing the public offices in this country. He knew the suggestion of 2 foot-candles was a fair average, and 3 foot-candles was a desirable attainment; but these had led in the department where he spent his working days to an enormous number of perfectly frivolous complaints.

Improvement from Wasted Energy.

Mr. J. G. Clark thought, looking back over the last eight or ten years, there had been considerable improvement in the lighting of factories and workshops. There was, however, still a large amount of work to be done; and there were immense opportunities for improvement. It could not be too much emphasized that these improvements could be carried out without any additional consumption of energy. There was a very large amount of waste of energy going on in connection with illumination; and if the managers of factories could be made aware that the lighting could be considerably improved without increasing the cost of the energy consumption, a great deal of good would have been done. In fact, the cost instead of being more might be less.

Importance of Maintenance.

Mr. S. B. Chandler said the Illuminating Engineering Society were to be congratulated on the work they had done in advancing the science of illumination. He should like to emphasize the point as to maintenance. It was important that once an installation had been made, it should be maintained so as to keep up the same efficiency right along the line.

[The hour had become somewhat late at this stage of the discussion; and therefore various gentlemen present who were invited to speak promised to communicate their remarks in writing.]

Gas Lighting for Factories—Some Examples.

Mr. W. A. Bishop (Croydon) writes as follows: I feel that the views expressed by our esteemed Honorary Secretary must appeal to all present with peculiar significance—coming as they do from a gentleman who, by reason of his international experience, is specially qualified to direct attention to modern illuminating engineering practice. In the light of this, and without opportunity of a preliminary study of the paper, I do not feel justified in offering direct comment upon Mr. Gaster's paper. But very briefly I should like to outline the case for gas lighting in factories and workshops. This was referred to in December last, when a paper entitled "The Progress of Gas Lighting in Relation to Illuminating Engineering" was read before this Society, and slides were shown of typical polar curves and installations. On that occasion, however, the meeting mainly consisted of members of the gas industry; but this evening one has reason to believe that the sister industry is well represented. This being so, and having regard to the fact that we have just seen upon the screen views of a particular high-pressure gas-lighting installation referred to in the afore-mentioned paper, it occurs to me that a few words from the "gas" point of view may not be out of place. Gas lighting and electric lighting have developed side by side. Both industries have made wonderful strides, with the result that to-day there is a wide and legitimate field for each. Of these two forms of illuminant, one cannot be said to have a monopoly over the other. The efficiency of modern gas lighting is good. It is favourably placed with regard to installation costs; maintenance expenses are low; the quality of the light is admittedly of a high order; its relatively low intrinsic brilliancy is also a commendable feature; and the automatic lighter (enabling lights to be placed high up and generally speaking in inaccessible positions, and controlled either singly or in groups from a central point) places it in a much happier position than it formerly enjoyed. As compared with the old upright-mantle burner, the modern high-pressure inverted burner reveals an increased efficiency of over 200 p.ct. But I must not wander from my point—gas lighting in factories and workshops. Added to the

merits of modern gas-lighting (which I have just indicated) gas to-day has, for heating operations, an almost universal scope of application. In the interests of economy, it is largely applied under pressure, which gives a most useful introduction to the installation of high-pressure lighting. The efficiency of high-pressure burners may be taken to be 95 to 97 candle-hours per centi-therm (mean lower-hemispherical candle-power). The listed candle-powers of high-pressure burners are a trifle misleading; and I find the following values in terms of mean lower-hemispherical candle-power to apply:

Nominal.		Actual.
150 C.P.	..	157·5
300 ,,	..	280·0
500 ,,	..	452·8
1000 ,,	..	891·0

These nominal ratings appear to be in terms of maximum horizontal candle-power of the bare mantle; and I should like to suggest that manufacturers be urged to state the duty of their lamps, complete with reflectors, in terms of mean lower-hemispherical candle-power, as gas people as a whole do not yet appear desirous of involving their calculations by adopting output ratings in terms of lumens. In my own town, I find that with "local" lighting for factory and workshop practices (according to the purposes served) the foot-candles measured either on the actual benches or machines vary from 4 to 6·5, while general lighting schemes reveal intensities of 2·5 to 3 foot-candles upward, measured on a plane one metre above floor-line. It is our practice, when equipping premises with "local" lighting, to provide "top" lighting for the purpose of giving a general illumination of about 0·5 foot-candle. The lamps referred to on the screen are part of an installation of twenty-nine 1500 and 1000 c.p. lamps. They function at a pressure of 81-inches water column; the requisite increased pressure over the ordinary main supply being obtained by a local compressor of 1000 c.ft. per hour capacity, driven by a direct-coupled electric motor. The interior of the workshops is white-washed. The lamps are hung 25 ft. above floor-level, and the spacing varies from 24 to 30 ft. apart, centre to centre. This general lighting is reinforced by portable "spot" electric lighting; plugs being arranged around the workshops. The mean illumination provided by this general system of gas lighting varies from 2·5 to nearly 4 foot-candles in the different shops. Another installation of interest is that of a constructional engineering workshop in which are installed the following lamps: 21 of 150 c.p. (nominal); 35 of 300 c.p. (nominal). The gas consumption for this lighting installation amounts to, approximately, 1·3 therms per hour, costing (at 1s. 1d. per therm) 1s. 5d., and the maintenance costs, including labour charges, 1s. 6d.* per burner per annum; the actual mantle renewals per burner per annum were 1·02*, and 30 p.c. of the total maintenance charge relates to labour. With regard to screening light sources, although the intrinsic brilliancy of gas lighting is relatively low, it needs reducing in the case of lights placed in the line of normal vision; and by the use of vitreosil, this can economically and conveniently be effected—in fact, the use of vitreosil conforms to the requirement laid down by the Departmental Committee on Workshop and Factory lighting, that no light source (either mantle or filament) shall be directly visible to the eye. Mr. J. G. Clark mentioned at the December meeting that vitreosil reduced the intrinsic brilliancy of gas mantles to about 10 candles per square inch; and my experience is much in accord with his. It, however, seems to me that the light emerging from the vitreosil has an increased ultra-violet component; and I should be interested to know if any members of the Society have anything to say upon this subject. While speaking on this question of obscuring light sources, one may mention that, for local lighting, this is very readily done by the aid of deep reflectors; while in the case of general lighting, Messrs. Keith and Blackman Co., Ltd., have introduced a circular opal band having a depth equivalent to the length of the mantle. Referred to a nominal 500 c.p. lamp with clear globe only, the effect of this opal screen is to reduce the mean lower-hemispherical candle-power by a little over 9 p.ct. So far, I have only mentioned high-pressure lighting; but a word or two must be said with regard to small-mantle clusters on low-pressure superheated burners, as the efficiency is distinctly good, being of the average order of about 64 candle-hours per centi-therm. Installation costs are, of course, lower than in the case of high-pressure lighting; and maintenance expenses are very favourable. We have just equipped a large distillery on the outskirts of Croydon with a number of these lamps in three, four, six, and eight burner sizes; and this system of lighting will, I feel sure, prove of increasing competitive importance. The durability of the small mantle is well appreciated; and I am confident it has come to stay. I may mention that one six-burner cluster with fairly deep enamelled reflector on gas of a little under 500 B.Th.U. per cubic foot gave on test the remarkable result, at 25-10ths pressure, of over 50 candles per cubic foot (mean of eight equidistant angular readings in the lower hemisphere), and showed a reading of just under 1000 candle-power at 66°. In conclusion, I think there is need for co-operation among gas-lamp manufacturers in the standardizing of reflectors, particularly for factories and workshops; and I should also like to call attention to the importance of carefully looking into the respective installation and running costs of the two gas-lighting systems referred to.

* These figures are in respect of the year ended December, 1921.

Scottish Junior Gas Association (Western District).—There will be a meeting next Saturday evening, March 11, in the Royal Technical College, Glasgow, when Mr. G. D. Alexander (Glasgow) will read a paper on "Meter Survey Work." Then for Saturday, the 25th inst., a visit has been arranged to the Provan Gas and Chemical Works of the Glasgow Corporation. The date of the annual social is Saturday evening, April 8, in the Central Halls, Bath Street, Glasgow.

Cremating by Gas.—Under the chapel of the Hendon Park Cemetery, a new crematorium, where gas is utilized instead of coke—far greater heat being obtained, and the necessity for stoking done away with—has just been satisfactorily tested. The test was made with the carcases of sheep.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Cubic Feet Increases Converted to the Therm Basis.

SIR,—In the penultimate issue of the "JOURNAL," you published two invaluable tables on the working of the three Metropolitan and some of the Suburban Companies, calculated on the volume and thermal basis respectively. In your editorial note you remark that a comparison of these two sets of figures is calculated to astonish some gas administrators. The lesson brought out by Mr. Bradfield in his compilation is of the greatest importance, and demands the fullest possible consideration. The tremendous disturbance of the business of gas supply occasioned by the war is not, I fear, even to-day fully realized, nor that its harmfulness was not confined to a reduction in the shareholders' dividends.

Perhaps this can be best brought home by a comparison: and I will take for the purpose the year 1908 and the one just closed. The following table gives a comparison of the business of the three Metropolitan Companies based on the volume output.

Gas Sold.—Cubic Feet (Thousands).

Company.	Year 1908.	Year 1921.	Increase.
Gas Light and Coke Company .	21,946,331	30,382,532	38·44 p.ct.
Commercial	3,123,155	3,590,627	14·97 ,,
South Metropolitan	12,302,152	13,955,591	13·44 ,,

If, however, the thermal figure is used, which is the only one of any value, the figures would be as follows:

Gas Sold—Therms.

Company.	Year 1908.	Cal. Value.	Year 1921.	Cal. Value.	—
Gas Light and Coke Co.	128,627,446	586·1*	146,348,303	482 .	13·78p.ct. inc
Commercial	17,598,978	563·5*	17,235,010	480†	2·07 ,, dec.
South Metropolitan. .	75,990,592	596	78,993,409	553	3·55 ,, inc.

* Calculated. † Estimated.

The table, however, does not accurately picture what has happened, since in the interval the Gas Light and Coke Company have absorbed two other undertakings. There are no published figures giving the proportion of the total consumption accounted for by these additions; but it will probably be not far out to assume that since the amalgamations the output in the two added districts has increased yearly by 5 p.ct. by volume. If this figure is taken, the result would then be modified as follows:

Gas Sold—Therms.

Company.	1908.	1921.	—
Gas Light and Coke Company	128,627,446	127,526,044	0·86 p.ct. dec.
Commercial	17,598,978	17,235,010	2·07 ,, ,,
South Metropolitan . . .	75,990,592	78,993,409	3·93 ,, inc.

It will, of course, be understood that this comparison is based upon an estimate, which may or may not be quite accurate; but it is probably not far from the mark. I am aware, too, that in the period under consideration strenuous efforts have been made to substitute economical gas-consuming appliances for more wasteful ones, and that 1921 was a bad year to compare.

CHARLES CARPENTER.

South Metropolitan Gas Company,
709, Old Kent Road, S.E., March, 7, 1922.

Coke Breeze for Steam-Raising.

SIR,—We hope that an abstract from a letter received from our agents in Scotland (Messrs. Willock Reid & Co., Ltd., of Glasgow) may not be without interest to those managers and engineers of chemical works and kindred industries who are constantly endeavouring to secure good results, often under most adverse conditions, in their boiler-houses. They say in their letter: We had arranged with the manager of —— Chemical Works to get particulars of how the boiler was doing after they had had an opportunity of testing it over a fair run, and are very pleased to say that the results are greatly beyond their most sanguine expectations. The particulars, which we have no doubt will interest you, are as follows:

Period, Six Weeks.

38 tons 14 cwt. coke at 24s. 3½d.	£46	19 3
121 ,, 3 ,, breeeze at 4s. 3½d.	25	17 5
6 ,, 19 ,, ,, 6s. 8d.	2	6 4
166 tons 16 cwt. fuel Value . .	£75	3 0

Comparison with Six Weeks' Fuel Consumed in the Previous Quarter.

256 tons 19 cwt. at 20s. 9½d.	£266 17 3
Saving difference	191 14 3
Per week	31 19 0½
Per 50 weeks	1597 12 1

Less allowances for increased cleaning, &c., say at £60 per 50 weeks.

Net saving value £1537 12s. 1d.

In addition to the above, their manager informed us that they have a causticizer which they have on usually for a period of five hours at a

time, and also an evaporator which they run for nine hours at a time. The amount of steam taken by the cauticizer is equal to a full head of steam through a 2-in. pipe. Before they had the turbine furnace they found it necessary to arrange their work so that these two plants were not on at the same time—in fact, they had to stop some of their other processes in order to get sufficient steam. If they tried to use them both, the gauge immediately dropped to about 35 lbs., which is practically equal to stopping the whole works. Now they are using the causticizer and evaporator at any time they please, irrespective of whether one or both may be on at the time. As a test, their manager arranged that both these plants should start together from cold; and the result was that, by starting the boiler with 10 lbs. pressure, they ran for about ten hours, and at the end of the time the gauge indicated 80 lbs., which means practically no loss of steam. Needless to say, they are all perfectly satisfied.

The foregoing speaks for itself. The figures relate to a furnace fitted to a 30 ft. by 8 ft. Lancashire boiler to generate the steam required for general manufacturing purposes. Previously the firm were using large coke and two boilers to obtain the necessary steam. We fitted one boiler with a set of turbine furnaces; and they started to burn coke breeze, and found that they could easily maintain their full steam output on the one boiler, using this class of fuel.

We might add that while the figures do indicate that a proportion of coke and breeze were used as fuel, the coke was used simply because they had it in stock. After finishing the stock they worked on breeze only.

Another advantage which the firm had not expected was obtained by the better quality of the flue gases. At this particular works they utilized their flue gases in one of the processes of manufacture; and a flue gas, containing a high percentage of CO_2 was an advantage, as this greatly facilitated the particular process of manufacture.

We have given this experience somewhat in detail, as it seems to us that the need of the manufacturer to-day is for increased economy in all the processes of manufacture; and possibly nowhere is the need greater than in chemical works and kindred industries.

Feb. 28, 1922. THE TURBINE FURNACE CO., LTD.

Change Wheels and Prepayment Meters.

SIR,—It occurs to me that now at any moment, with the reduction in the price of gas, there will be wanted a decision as to action in regard to the change wheels to give so many more cubic feet for a penny.

For the past five or six years, at a very big cost to the ratepayers and to the shareholders of gas companies, these wheels have been changed again and again. It occurs to me that, if only from a question of economics, the position should be altered—and (may I say) in the favour, so far as controlling is concerned, of the corporation or company—that there should be no policy of hastening to change the wheels each time there may be a slight reduction of price and an increase of a few cubic feet for a penny, but a continuance with the existing wheels until such time as prices (say, in eighteen months or two years) have become normal. It would save considerable money for both manufacturer and corporation, also company; and surely we are all out, unless we are false to ourselves, for economy.

I realize that with the variety of consumers it was not an easy matter, when gas was increasing in price and there was a decrease of cubic feet for a penny, to demand and get a *plus* on what the meter contained in coin, but now that it is likely to be general for the existing meters to contain more than the company or corporation require in coin, it will be a much more simple matter to refund to the consumer the surplus.

I trust this matter will have the full consideration it demands, both from the commercial side of the gas authorities, as well as the manufacturers, and sign myself

"SHAREHOLDER AND RATEPAYER."

REGISTER OF PATENTS.

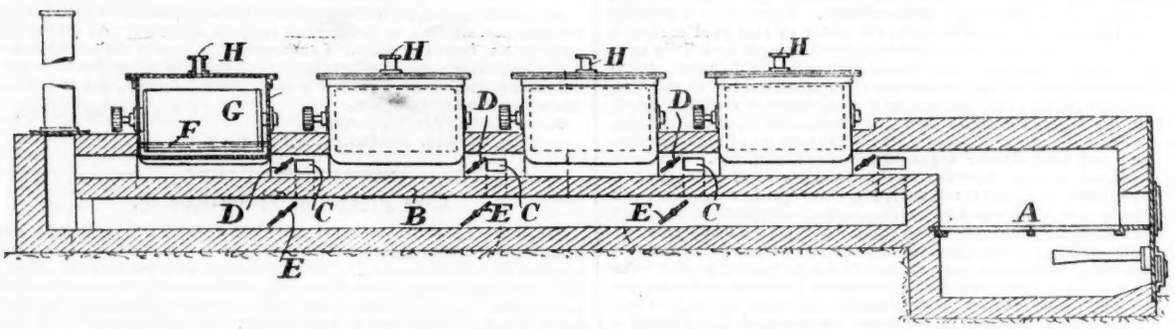
Apparatus for Heating Materials at Successively Different Temperatures.—No. 174,690.

THERMAL INDUSTRIAL AND CHEMICAL (T.I.C.) RESEARCH CO., LTD., DUCKHAM, Sir A. M., and MORGAN, J. S., all of London.

No. 29,678; Oct. 20, 1920.

In many processes, the patentees say, it is desirable that a substance which is to be heated for distilling it fractionally or destructively, or for producing some chemical change in it, should be exposed to successive temperature steps.

By the present invention, either of the methods described in specifications Nos. 25,804 of 1920 and 170,617, is applied to the heat treatment of a material in successive steps by causing it to pass repeatedly through molten metal; the successive temperature steps being attained either by varying the time during which the travel occurs (in which case a single bath of molten metal may be used) and/or by passing the material through successive separate baths of molten metal having different temperatures. Between each immersion and the next the material may be allowed to cool more or less, which in some cases is an advantage.



Duckham and Morgan's Heat-Treatment Plant.

The accompanying drawing is of a longitudinal section of four stills such as are described in specification No. 25,804 of 1920, arranged for the fractional distillation of tar oil. The stills are set in the flue of a furnace A. This flue is divided into an upper and lower flue by a partition B; and there is a bye-pass flue C putting the upper and lower flue into communication with each other at one end of each still. The upper flue alone communicates with the furnace, so that the proportion of heating gases passing along the lower flue is determined by the degree to which the valves D in the upper flue in front of each flue C are open. It will be seen that by suitable adjustment of these valves and of the corresponding valves E in the lower flue, the temperature of the several stills may be varied. The oil is fed into the still furthest from the furnace (and therefore at the lowest temperature) and is carried beneath the surface of molten lead F by the revolving drum G. It leaves this still and flows to the next, and so on throughout the series; the residue being finally discharged. The volatile constituents expelled in each still are collected separately from the necks H.

When a single bath of molten lead at substantially uniform temperature throughout is used, two or more drums or some equivalent device for moving the material through the molten metal are employed, revolving or travelling at successively lower speeds, if the heat treatment is to occur in steps of increasing temperature, or at successively higher speeds if it is to occur in steps of decreasing temperature. The first device delivers the material to the second, and so on.

The invention is particularly suitable for fractional distillation of liquid or solid material. As an example of the latter, the destructive distillation of wood may be mentioned—there being considerable advantage in heating the wood in successive stages for obtaining the best yield of the several products.

Gas-Engines.—No. 174,833.

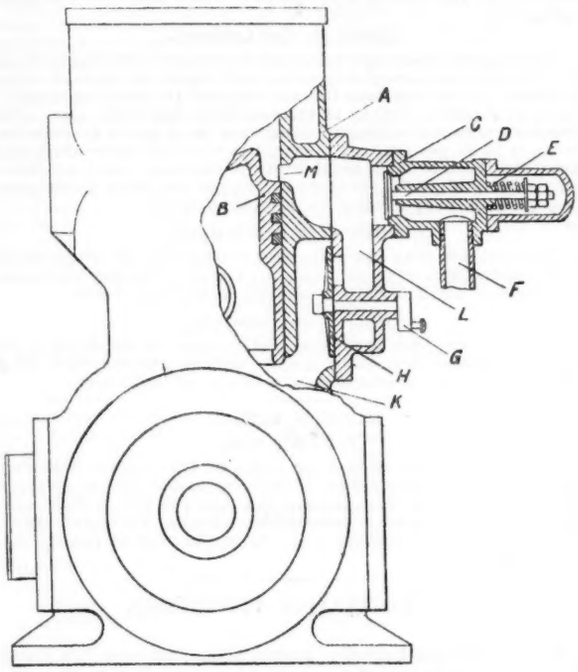
PETTER, P. W., and PETTERS, LTD., of Yeovil.

No. 35,453; Dec. 16, 1920.

This invention is more particularly applicable to gas-engines of the two-stroke type. In engines of this type, gas and air are usually admitted together into the crank chamber. As they work under crank chamber compression, there is a liability to leakage of the gas through the bearings of the engine; and as the crank chamber contains a mixture of gas and air, there is some danger of an explosion taking place in the crank chamber in certain circumstances. The object of this invention is to provide an improved method of supplying the gas charge by first admitting it to a special chamber between the crank chamber and the cylinder. The gas is subsequently passed into the engine by admitting to the special chamber the air from the crank chamber which carries the gas charge with it into the cylinder.

The accompanying drawing shows in section a cylinder A, a piston B moving therein, a gas-valve box C containing a valve D controlled by a spiral spring E and controlling the communication from the box C to the gas chamber L; the box C receiving the fuel gas by a supply pipe F coming from a main (not shown), while a rotary baffle or valve H, controlled by the governor by means of a spindle and lever or crank G, governs the supply of air to the gas chamber L from the crank chamber K. The independent gas chamber L is placed between the crank chamber K and the cylinder A of the engine, and is adapted to receive fuel gas through the valve D from the gas-valve box C. Supposing the piston of the engine to be moving on its down stroke, the moment the inlet port M is uncovered by the piston, the difference in pressure between the cylinder and the crank chamber causes a rush of air from the crank chamber through the special gas chamber L, which air carries with it, and mixes with, the gas in the chamber, so that both together pass through the ports M into the cylinder. The opening of the valve D takes place in the following manner. The valve commences to open as soon as the piston B on its up stroke covers the air port M. On the piston continuing its up stroke, air is drawn into the

crank case through the air valve at the back of the crank case. At the same instant gas is driven into the special gas chamber L through the gas valve D. When the piston commences its down stroke, the valve D is closed by the tension spring E and is further held closed, after the air port M is uncovered by the piston, by the pressure caused by the rush of air from the crank case through the chamber L and port M into the cylinder.



Petter Improved Two-Stroke Engine.

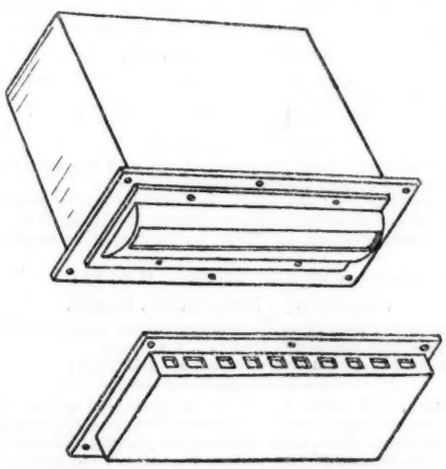
By the invention the amount of air and gas supplied to the cylinder can be controlled in direct proportion to the load on the engine; this control being secured by means of the air valve H connected through the lever G to the governor. Absolute safety is secured, as the gas is received into the special gas chamber L and is not drawn into the crank case.

Ventilators or Guarded Outlets for Air Shafts, Gas Flues, &c.—No. 174,806.

ROGERS, R. J., of Birmingham.

No. 33,381; Nov. 26, 1920.

This invention comprises improvements in ventilators for air shafts, gas flues, &c., of the kind in which the outlet is in a projecting part and has a cover plate over it and spaced away from it, so that any air entering the cover must pass across the opening. The object is to provide a construction in which there is little liability of the air rebounding from the cover plate into the outlet. The device comprises a box-part having at one side a part-cylindrical portion with a relatively narrow outlet and a cover having a series of openings at opposite sides; these openings being disposed so that air passing through them is directed across the said outlet. The ventilator is more particularly intended for use on an outlet flue from gas cookers, heaters, or like apparatus, or an air and a gas flue in a wall.



Rogers' Flue Outlet.

The perspective view given sufficiently illustrates the ventilator without detailed description. It will be understood that while this embodiment is manufactured from simple iron castings, the device may quite readily be made from sheet metal or earthenware or other suitable substance.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 1.]

Nos. 4865 to 5673.

ACÉTYLÈNE DISSOUS ET APPLICATIONS DE L'ACÉTYLÈNE.—"Apparatus for intermittent distribution of gas." No. 5116.
ALLENDER, J. J.—"Plate, &c., heating-racks for gas-stoves." No. 5274.
APPLEBY, E. G.—"Apparatus for feeding fuel into gas-producers, &c." No. 5089.
BENNETT, G. H.—"Gas heated soldering-irons." No. 5144.
BENTLEY, G. H.—See Appleby, E. G. No. 5089.
BESWICK, W.—"Manufacture of producer gas with recovery of bye-products." No. 5118.
BOIVIE, S. E.—"Burners." No. 5348.
EATON, J. G.—"Air and gas compressors." No. 5649.
GEORGE, W. J.—"Valved connections for pipes, &c." No. 5042.
HAILEY, F. P.—See George, W. J. No. 5042.
HANSFORD, J. B.—"Gas or air washers or scrubbers." No. 4971.
IRONSIDE, T. G.—"Distilling oil shales, coal, &c." No. 4969.
LEWIS, A.—"Rendering innocuous the products of combustion from geysers, &c." No. 5169.
LITTLE, L. E.—See George, W. J. No. 5042.
MACLAREN, A. F.—"Retorts." No. 5559.
MOELLER, J.—"Method of fractional distillation of hydrocarbons." No. 5041.
MONKHOUSE, F. O.—"Means for distributing light from lamps." No. 5228.
OAKLEY, P.—"Cooking, &c., ovens." No. 5273.
OAKLEY, P.—"Plate, &c., heating-racks for gas-stoves." No. 5274.
RAMBUSH, N. E.—See Beswick, W. No. 5118.
SAFE SUPERHEAT, LTD.—See Maclaren, A. F. No. 5559.
SCHINDELER, M.—"Automatic bye-pass apparatus for fluids." No. 5126.
SIBTHORPE, E. A.—"Safety-devices for gas lighting and heating supply." No. 4997.
SLATER, J.—See Lewis, A. No. 5169.
STOVES, LTD.—See Oakley, P. Nos. 5273, 5274.
TATE, G. E.—See Monkhouse, F. O. No. 5228.
THOMSON, J. T.—"Pipe-joints." No. 5470.
WEBBER, W. H.—See Boivie, S. E. No. 5348.
WILKINSON, A. C.—See Boivie, S. E. No. 5348.
WOODALL, DUCKHAM, AND JONES (1920), LTD.—"Tunnel kilns." No. 5546.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Kilmarnock Gas Provisional Order Bill: Brought from the Commons; read the first time; and (pursuant to the Private Legislation Procedure [Scotland] Act, 1899) deemed to have been read a second time and reported from the Committee.

The petition of the Croydon Gas Company for leave to introduce a Bill to convert the existing capital of the Company, to authorize the raising of additional capital, and for other purposes, together with a copy of the proposed Bill, was read and referred to the Examiners.

STOKE-ON-TRENT CORPORATION (GAS CONSOLIDATION) BILL.

This Bill (see "JOURNAL" for Jan. 18, p. 151) came before the Unopposed Committee of the House of Lords on Tuesday (Feb. 28), and it was decided to postpone its report for third reading pending the completion of one or two alterations, in regard to which the Lord Chairman's Counsel has to be satisfied. There is an important alteration in the terms of the transfer of the Staffordshire Potteries undertaking of the British Gas Light Company to the Corporation. Clause 8 has been deleted, and in its place there is a clause confirming an agreement as to the transfer, which is scheduled to the Act. This clause originally laid down that the transfer should take place as from Dec. 31, 1920, subject to the debentures of the Company, for the following consideration: (*a*) The payment by the Corporation to the Company of £100,000 in cash, and (*b*) the issue by the Corporation to the Company, or to such persons as the Company shall direct in writing (at least fourteen days before the day of transfer), of the stock created by the present measure. The Corporation are now seeking to borrow, for the purchase consideration payable to the Company in cash, £345,000, repayable in 40 years from the day of transfer. With regard to the transfer and vesting of the undertaking of the Company to and in the Corporation, it is now provided that on payment by the Corporation to the Company of the sum of £345,000, in accordance with the scheduled agreement, the undertaking shall stand transferred to, and vested in and belonging to, the Corporation, subject to the debentures of the Company.

Clause 31, as in the original Bill, gave the Corporation power to

manufacture as well as purchase, sell, let for hire, fix, repair, and remove engines, stoves, pipes, fittings, &c.; but the clause has been amended, and the power to manufacture deleted.

The clause with regard to the creation of stock for the purchase of the undertaking, which contemplated, on the passing of the Act, the creation of £245,000 of stock, to be redeemable at par on Sept. 29, 1962, or at the option of the Corporation by six months' notice in writing to the Company to expire on, or on any day after, Sept. 29, 1937, &c., is deleted, as a consequence of the deletion of clause 8, already mentioned.

A clause has also been inserted in the Bill for the protection of the Staffordshire County Council, in respect of roads, bridges, &c.

HOUSE OF COMMONS.

Progress of Bills.

Blackburn Corporation Bill: Read a second time and committed.

Kilmarnock Gas Provisional Order Bill: Considered; read the third time; and passed.

Sheffield Gas Bill: The Standing Orders not previously inquired into which are applicable to this Bill have been complied with.

Windsor Gas Bill: The petition of the London and North Western Railway Company against this Bill has been withdrawn.

Chester United Gas Company.

It was reported to both Houses that in the case of the petition for the Chester Gas Bill, the Standing Orders have not been complied with. The report was referred to the Select Committee on Standing Orders.

Gas Regulation Act, 1920.

In the House of Lords on the 28th ult., it was moved by Lord Somerleyton that the drafts of Special Orders under section 10 of the Gas Regulation Act, 1920, on the application of the Dursley Gas Light and Coke Company, Ltd., Newport (Mon.) Gas Company, Rushden and Higham Ferrers District Gas Company, Borough of Stafford, Swansea Gas Light Company, and the Borough of Torquay, be approved; and this was agreed to. A similar resolution was moved by Sir William Mitchell-Thomson in the House of Commons the next day, and passed.

Public Utility Companies (Capital Issues) Act, 1920.

In both Houses a copy was presented of a report by the Board of Trade under the Act on an application by the Hoddesdon Gas and Coke Company, Ltd.

Claim for Requisitioned Gas-Works Coal-Wagons.

Mr. H. McLaren asked the Parliamentary Secretary to the Ministry of Transport why the claim of the Hinckley Urban District Council for compensation for the requisitioning by the Government of two of their Gas Department coal-wagons had been refused; whether he was aware that certain wagons were taken from the Hinckley Urban District Council's service at a time when they were urgently required by the Council for the transport of coal in the year 1919, and when it was extremely difficult to obtain coal; that such wagons, although diverted from the Council's service, were untraceable for several months, and were allowed to remain unused in sidings during practically the whole of the time they were under the control of the Government.

Mr. W. C. Bridgeman (the Secretary for Mines), who replied, said that owing to an acute shortage of coal in the Metropolitan area caused by a coal strike in the Midlands in March, 1919, 2000 wagons were requisitioned by the Controller of Coal Mines to transport emergency supplies. Two of the wagons were the property of the Hinckley Urban District Council. Payment was made for all the wagons on a uniform basis. It was true that there was delay in returning some of the wagons to their owners owing to the congestion then existing on the railways; but every reasonable precaution was taken by the Coal Controller to expedite their return. He regretted that he could not admit the claim of the Hinckley Urban District Council for any further payment than had already been made to them.

Southgate and District Gas Company.—It is pointed out by the Directors that, compared with 1920, the sales in the past year have been 0·19 p.ct. more. The final dividends recommended make the distribution for the year on the original and additional capital 10 and 7 p.ct. respectively, as paid prior to the war. These dividends leave a sum to the credit of the profit and loss account to be carried forward of £3148. The Company's Order prescribes a maximum price of 1s. 5·8d. per therm; and the declared calorific value of the gas is 450 B.Th.U. As from Jan. 1 last, the price to consumers has been reduced from 1s. 2·66d. to 1s. 2d. per therm. A vacancy having occurred upon the Board through the death of Mr. E. C. Roberts, this has been filled by the appointment as a Director of Mr. Frank H. Jones.

Brighton Gas Company and Co-Partnership.—There is to be a meeting of the Brighton and Hove General Gas Company to-day, at which the proprietors will be asked to sanction the putting in force of a scheme to enable the employees to participate in the profits of the undertaking as from Jan. 1, 1921. Thereafter the ordinary meeting will be held, at which the Directors will report a reduction, as compared with the preceding year, of 2·71 p.ct. in the sales of gas. The profits for the past year amount to £69,353; the sum available for distribution being £70,807. The final dividends recommended will make, in the case of the original ordinary and "A" ordinary stocks, a distribution for the year of 11 p.ct. and 8 p.ct. respectively, leaving £21,249 to be carried forward. During the year carbonizing charges—*i.e.*, for coal, oil, and labour—have fallen by 9 p.ct.; but the realized value of residual products has fallen by 10 p.ct. In view of further purchases of coal and oil at more favourable prices, the Directors reduced the charge for gas throughout the area of supply by ½d. per therm (to 1s. 1½d. in the inner area) as from Oct. 1; and they have given notice of an additional reduction of 1d. per therm (to 1s. 0½d. in the inner area) to take effect from Jan. 1 last.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications to the Board of Trade under the Gas Regulation Act.

Barnstaple Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 3s. 6d. per 1000 c.ft. within the limits of supply as defined by the Barnstaple Gas Act, 1869, and 4s. within the extended limits of supply as defined by the Barnstaple Gas Order, 1911. The maximum price now authorized in respect of the supply of gas to public lamps is 3s. 6d. per 1000 c.ft. The prices which the undertakers have asked the Board of Trade to substitute for these are 19·18d. per therm for the price of 3s. 6d. per 1000 c.ft., 20·45d. per therm for the price of 4s., and 19·18d. per therm for the price of 3s. 6d.

Littleborough Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 9d. per therm.

Milnrow Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 9d. per therm.

SPECIAL ORDER.

Kidsgrove Gas.

Application is to be made to the Board of Trade by the Kidsgrove Gas Light Company for a Special Order to enable them to purchase and supply gas in bulk, to regulate the supply of gas, to make new provisions as to the issue of redeemable preference or debenture stock, to vary the dividends payable according to the price of gas, and for other purposes.

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Conisbrough Gas Company, Ltd.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18·4d. per therm; and this price shall be substituted for the price of 5s. per 1000 c.ft. wherever it occurs in section 27 (price of gas) of the Conisbrough Gas Order, 1903.

As from the declared date, "therm" shall be substituted for "1000 c.ft.," and the words "fifth of a penny" for the word "penny" wherever they occur in schedule B to the Conisbrough Gas Order, 1903.

Prepayment meter clauses are included. (March 4.)

Dowlais Gas and Coke Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 17d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five.

After the declared date, the price of 7·8d. per therm shall be substituted for the price of 3s. 3d. per 1000 c.ft. mentioned in section 64 (limit of price for gas for public lighting) of the Dowlais Gas Act, 1906.

Prepayment meter clauses are included. (March 3)

Ely Gas and Electricity Company, Ltd.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 17·4d. per therm. (March 4.)

Gowerton Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16·4d. per therm.

Prepayment meter clauses are included. (March 2.)

Mirfield Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 13·4d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five-and-three-fifths.

Prepayment meter clauses are included. (Feb. 25.)

Mynyddislwyn Urban District Council.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 20·4d. per therm.

Prepayment meter clauses are included. (March 2.)

Radiation, Ltd.—The report to be presented at next Friday's meeting in Birmingham, with the balance-sheet of the Company as at Dec. 31 last, states that, after bringing in £40,753 brought forward from 1920, the balance of the revenue account is £169,078. After deducting the interim dividends (£61,476) paid in August last, there remains at disposal the sum of £107,601, which the Directors recommend be appropriated as follows: Final dividend of 3 p.ct. to Dec. 31 on the preference shares, less income-tax, £22,837; final dividend of 3⅛ p.ct. on the fully-paid ordinary shares to Dec. 31, free of income-tax, £48,797; final dividend of 3⅛ p.ct. on the partly paid ordinary shares to Dec. 31, free of income-tax, £5297; carrying forward to next year, £30,668.

COOKING FUEL.

By W. H. Becket.

[The second part of a Lecture delivered at the Cookery and Food Exhibition, Royal Horticultural Hall, S.W., on Feb. 24. The first part described the cooking fuel in use in past ages.]

Fuel is a term applicable to all substances that can be usefully employed for the production of heat by combustion. Any element, or combination of elements, susceptible to oxidation may, under appropriate conditions, be made to burn; but only those that ignite at a moderate initial temperature and burn with comparative rapidity, and —what is practically of more importance—are obtainable in quantity at moderate prices, can be fairly regarded as fuels. The elementary substances that can be so classed are, primarily, hydrogen, carbon, and sulphur.

More important, however, than the elements are the carbohydrates or compounds of carbon, oxygen, and hydrogen, which form the bulk of the natural fuels—wood, peat, and coal—as well as of their gaseous and liquid derivatives, coal gas, coal tar, pitch, and oil, which give high value as fuel.

Fuel may be divided into:

1.—Solid fuel—including wood, peat, lignite, and coal.
2.—Carbonized fuel—charcoal and coke.
3.—Compressed fuels—briquettes.
4.—Liquid fuels—tar, petroleum, benzene, alcohol.
5.—Gaseous fuels—natural gas, coal gas, furnace gas, producer gas, water gas.

All these fuels could be used for cooking purposes; but as we do not live in a sentimental, but purely utilitarian, age, we can eliminate those which fail to meet the necessary qualifications of economy, efficiency, and saving of labour, which are certainly necessary to-day.

I only propose to consider cooking fuel in its universal use—the home—as it is here that it is of most importance, both nationally and to the individual. Hotels, restaurants, and large institutions, when considered in comparison with the domestic fuel user, are of very little consequence. For this reason I have drawn up a new fuel table under four headings:

1.—Liquid fuel—petroleum.
2.—Smoky fuel—soft coal.
3.—Smokeless solid fuel—coke, charcoal, anthracite.
4.—Smokeless essences—gas and electricity.

I wish to review these cooking fuels in the order that they are enumerated. This brings us to the consideration of petroleum.

1.—Petroleum.

It is impossible to ignore or deny its possibilities as a cooking fuel; but at the same time we must not forget that the money paid for the purchase of petroleum goes out of this country—to the detriment of the exchanges—instead of into the pockets of British labour and of British investors, and to the relief of taxation. This is all the more indefensible as we have better fuels available which are also home products.

National Economy.

Britain at the present time is passing through one of the most serious economic situations in the whole of her history, so it is our first duty as citizens to relieve that position in every possible way we can. The oil industry would undoubtedly like to see petroleum firmly entrenched as a cooking fuel; but when we recognize that practically the whole of the supply comes from lands without the Empire, it should give serious-minded persons grave cause for thought.

Let us for a moment examine the sources of supply. Of the world's total supplies, 63 p.ct. is drawn from the United States of America, and a further 25 p.ct. from the Baku oil fields. The remaining 12 p.ct. is chiefly derived from Roumania, Galicia, India, and the Eastern Archipelago. The total annual output probably amounts to 1000 million imperial gallons. This shows us clearly that only a very small proportion of 12 p.ct. is drawn from British territory.

Rash Statements.

I remember reading during the late coal strike, and more particularly hearing people discuss with enthusiasm, the alleged fact that "the oil age" had arrived. I wonder if these enthusiasts had given the matter any consideration before endorsing these statements? One of the material factors in Britain's successful progress has been the abundance of excellent and cheap fuel located within easy distance of our great manufactories. I do not anticipate that anyone will dispute this statement; and I am strongly of the opinion that, after due consideration, we shall be prepared to condemn such ill-considered statements as "the oil age has arrived," as, if it were true, it could be literally construed that the decline of Britain's prosperity had definitely commenced.

An Economic Law.

The more closely one examines the source of the different fuels in domestic use, the more clearly it points to the existence of an economic law—that fuel must be of local origin, if procurable, to be economical from all points of view. It is only for these considerations that I propose to ignore the claims of petroleum as a cooking fuel, though there are others I could mention. I will therefore pass on to my second division.

2.—Smoky Fuel.

Under this category we have soft coal. It appears that coal was brought into use in London towards the end of the Thirteenth Century, and was used only in certain manufactures; but owing to the high cost of wood, its use became general. At the present time, about 40 million tons of coal are consumed annually for domestic purposes in the United Kingdom; but there is no means of ascertaining the percentage used as cooking fuel. The modern coal-fired cooking-range has given a fair degree of satisfaction. The hot-plate is efficient and economical, and the oven moderately so; but for providing the domestic hot-water supply (a duty which is generally combined in the cooking-range) it is not efficient, and the "stand-by" loss with the domestic range is far greater than is often realized. Soft coal will continue to be used in rural districts; but in the towns there is a decided movement to eliminate the kitchener.

In these days, when coal is retained, it is mostly in order to provide for cooking as a secondary duty, in conjunction with some other fuel which is installed for the real cooking service. This is illustrated in a large proportion of the Government housing schemes. In these new houses an inter-oven type of grate is generally found in the living room, and a gas-stove in the scullery. It is not entirely through inefficiency that the coal-range is falling into disrepute, but by reason of the labour it necessitates all through its use, and after. Woman is in revolt against fire tending, grate polishing, and flue cleaning. Another reason that serves to explain this movement, if any other be required, is the real desire for hygienic conditions.

The Government Departmental Committee on Smoke Abatement, in their interim report dated Jan. 29, 1920, state "The burning of raw coal is a dirty, wasteful, unscientific practice, and on grounds of economy, as well as of public health, it should be restricted as much as possible." With such a sweeping condemnation, we will turn to the cleaner atmosphere provided by smokeless fuel.

3.—Smokeless Solid Fuel.

Charcoal is one of our most ancient cooking fuels, but it cannot be given serious consideration to-day, as it is only used to a certain extent for grilling; being both scarce and costly. Coke and anthracite are valuable as cooking fuels, and are worthy of careful attention. It is only of late years that these smokeless fuels have received the public support that they deserve. This interest has been quickened with the realization of the public generally that the smoke nuisance, from which we have suffered all too long, must go.

Smoke Abatement.

The Government have given an excellent lead in this direction; and there is little doubt that a serious movement has set-in to abate smoke, which is not only a nuisance but an actual danger to health. Coke or anthracite offers a means to this end, and should be remembered when one is considering the elimination of the ordinary soft coal consuming kitchen range, with its inefficient saddle or boot-shaped boiler, and the substitution of gas or electric cooking—a proposal which inevitably raises the question of the domestic hot-water supply, a matter which is indeed inseparable from that of the correct fuel to use. The vogue of the coke-fired boiler has already assumed considerable proportions; so much so that I am informed that the demand for coke correctly graded for use in independent hot-water supply boilers of this type is already appreciable, and is steadily growing.

Dual Services.

Introduced primarily to supply hot water continuously at the minimum fuel cost, there is, however, a natural tendency to use the boiler fire as far as possible for minor cooking operations, such as boiling and simmering; and it has been found advantageous to incorporate in the design of these boilers a hot-plate to facilitate such operations. The efficiency of the primary function of the boiler is not necessarily reduced by this innovation. Coke graded to walnut size is the fuel generally used; the alternative being anthracite. The sooting effect of soft bituminous coal renders the employment of such fuel highly deleterious to the efficient transfer of heat to the water; and its use is not recommended.

Comparative Costs.

Comparison, therefore, is in this case limited to anthracite and coke. On a calorific power basis, the comparison normally (and particularly at present prices) as between anthracite, good house coal, and coke is all in favour of coke, as will be seen from the following figures:

	British Thermal Units obtainable per 1d. of Cost.
Coke nuts . . . . . (At 2s. 4½d. per cwt., 12,952 B.Th.U. as certified by the West Ham Testing Laboratory.)	50,900
Best house coal . . . . . (14,500 B.Th.U. at 3s. 4d. per. cwt.)	41,640
Anthracite nuts . . . . . (14,500 B.Th.U. at 4s. 9d. per cwt.)	28,490

The comparative radiant efficiency of coke and coal is an all-important factor in considering cooking fuel, as it is, of course, mainly by means of radiation that the heat developed by the fuel is transmitted to the oven and hot-plate. The following extract from an official report published by the Fuel Research Board on the radiant efficiency of coke fires is significant: "Weight for weight, dry coke of calorific value 13,000 B.Th.U. per lb. gave some 4 or 5 p.ct. more radiation than coal of a calorific value of 14,500 B.Th.U. per lb. in the same grate and burning under similar conditions."

Anthracite Range.

Another type of apparatus in which cooking and hot-water supply are combined on an equal basis (that is to say, the boiler, as in the ordinary kitchen range, is not entirely a secondary consideration) is the anthracite range as typified in the "Kooksjoie." Here, again, the question of fuel is all-important if costs are to be kept at a minimum.

Designed primarily for use with anthracite, the limitations of that fuel were acutely felt by users of this apparatus during and since the war. At 95s. per ton, the price is unduly high; but this is occasioned largely by the limited output, and also the large demands from foreign countries, where smokeless fuel is more fully appreciated. Whereas anthracite is produced mainly in one corner of the kingdom—*i.e.*, South Wales—coke, which is equally smokeless, is now produced at some 1600 gas-works up and down the country. Distribution costs are thus eliminated; and users of anthracite cooking-stoves have recently discovered the financial advantages of coke. In this connection, an observant user of the "Kooksjoie" stove gives the result of his experience, which may be interesting.

Practical Experience Worth More than Theory.

"With anthracite, we used on an average 32 lbs. per day (of twenty-four hours); the present price being £4 15s. per ton. With coke we

found we required only about 24 lbs. per day, at £2 12s. 6d. per ton. The comparative costs are thus about 16d. with anthracite and 7d. with coke per day. Also we found that the heating efficiency of the coke is quite as great—indeed, it appears to us even greater—and no extra trouble whatever is caused by its use. There is no difficulty whatever in keeping the stove alight throughout the night, and for cooking, both in ovens and on the hot-plate, it is perfect."

4.—The Smokeless Essences—Electricity and Gas.

We have examined some of the claims of smoky and smokeless solid fuels; and from the evidence it is apparent that, from most points of view, the latter have most to recommend their use as a cooking fuel, but particularly from the point of view of saving in labour. It is this point of view that most closely concerns women. Remembering Frederick Starr's statement that "The beginning of women's slavery was the discovery of fire," and in reviewing the developments of cooking fuel, advancement has been chiefly along one line—the reduction of labour. Soft coal was an improvement on wood, and coke and anthracite on soft coal; but it was not until the essence of the coal in the form of electricity and gas came into almost universal use—that is, in the last few years—that the whole labour of fire tending was eliminated. This period coincides with the complete emancipation of woman. I am not suggesting that the argument is conclusive; but the coincidence is significant.

Woman the Deciding Factor.

Woman's voice is now being heard in the affairs of the Nation, and with even greater force in local government; and she is all-powerful in the home. It is difficult to find any newspaper or magazine which does not give prominence to women's views and suggestions. They realize that in the home they have to manage the largest business in the kingdom, of which one of the most important departments is cooking; so the selection of the cooking fuel will not be a hasty decision. Having once experienced the freedom that the employment of the essence of coal affords, there is little doubt that this will be the cooking fuel of the future.

The Claims of Gas and Electricity.

It may be interesting to quote the history of the gas and electricity industries. The former was founded in the Chartered Company in London in 1812; and the first Electricity Supply Station in Great Britain was that of Eastbourne, established in 1882. With this introduction, let us consider the relative claims of the industries. At the same time, we must keep the fact prominently before us that both these cooking fuels are derived from coal; and the supply of this all-important mineral is not inexhaustible. For this reason, I propose to make the comparison under two headings:

1.—Is gas or electricity better serving the nation's interests in cooking fuel conservation?

2.—The comparative costs of the two fuels.

We will consider our first question.

Coal our One Source of Electricity.

We do not know the limit of efficiency of electricity as a lighting agent; but as the medium for the conveyance of production of heat it is limited strictly, and, in this country, fatally. I say "in this country, fatally" because the great insuperable obstacle to the economical generation, distribution, and utilization of heat in the form of electricity in the country is that there is, speaking broadly and practically (and not forgetting the Severn) no means of generating electrical energy here other than by the conversion of the potential heat energy of coal into electrical energy; and that is a most wasteful process. I say that upon the authority of Sir Dugald Clerk and his colleagues, Professors Cobb and Smithells, who investigated the question of relative efficiencies of coal-gas manufacture and electrical generation from the point of view of coal conservation, and published a report on the subject which has never been challenged in any serious or effective manner.

Ninety-Three Per Cent. Waste in Electricity Generation.

The facts were and are as follows:

1.—The average (not the worst, but the average) electric generating station of to-day destroys coal containing 100 heat units in the process of delivering to the consumer 7 heat units in the shape of energy—a loss of 93 p.ct.

2.—The most efficient generating station of to-day shows a loss of 88 p.ct., delivering to the consumer as energy only 12 heat units out of every 100 in the coal burnt under its boilers.

3.—The best result anticipated for the suggested super-stations (but never yet realized in practice at any existing station—and there are some large units in use) is an efficiency of only 18 p.ct.—82 heat units lost in generation and distribution for every 18 delivered to the consumer.

4.—Out of every 100 heat units in the coal carbonized at the "good practice" gas-works of to-day, (in round figures) 50 are returned to the solid fuel market as coke; 5 are recovered as tar; 22·5 are lost in manufacture and distribution; and 22·5 reach the consumer as gas. So that out of 100 heat units in the coal carbonized, 77·5 are delivered to the community, and only 22·5 are lost; while out of heat units that do not reappear after the process of carbonization as anything other than gas, (22·5 out of 45 =) 50 p.ct. are delivered as gas to the consumer.

5.—In the gas-works of the future it is likely that coal will be as completely as possible gasified, and that 75 heat units out of every 100 in the coal treated will be available for distribution as gas, as against 18 out of 100 available if the distribution be in the form of electric energy.

6.—After allowing in both cases for all losses in transmission and utilization—that is, after giving electricity credit for its somewhat higher "efficiency of utilization" than gas—there would be involved in the doing of equal heat work for the consumer the destruction of four tons of coal at the electric generating station of to-day, as compared with 1 ton at the gas-works of to-day; or three tons at the super-station of the future, as against 1 ton at the gas-works of the future. From the national point of view, this is of the utmost importance.

Cooking Comparisons.

My second comparison is in the cost of these cooking fuels. I will take gas at the price of 1s. 1d. per therm, which represents 100,000 B.Th.U., and electricity for cooking purposes at 2½d. per Board of Trade unit (or kilowatt), such unit representing 3420 B.Th.U. A pennyworth of gas, therefore, provides

$$\frac{100{,}000}{13} = 7692 \text{ B.Th.U.};$$

and a pennyworth of electricity:

$$\frac{3420}{2\frac{1}{2}} = 1368 \text{ B.Th.U.};$$

Actual Efficiencies.

Now let us compare average gas and electric cooking-stoves for the whole duty that a domestic cooking stove would be called upon to perform.

The efficiency of the hot-plate with both gas and electricity is about 50 p.ct. As regards the oven, Mr. A. H. Barker gives the average efficiency of the gas oven at 11 p.ct., and the electric oven at 21 p.ct. Under ordinary working conditions, the hot-plate provides about 70 p.ct. of the duty, and the oven 30 p.ct. So, for our comparison of cost, if we take a series of gas-cooking operations consuming 10 therms, 1,000,000 B.Th.U. will have been consumed as follows:

Hot-plate	700,000 B.Th.U.
Oven.	300,000 B.Th.U.

On the foregoing figures, the electric stove would require for the same duty:

Hot-plate	700,000 B.Th.U.
Oven . . . $\frac{300{,}000 \times 11}{21}$	= 157,143 B.Th.U.
Therefore, Electricity requires	857,143 B.Th.U.
and Gas ,, ...	1,000,000 B.Th.U.

The comparative costs for gas and electricity at the prices quoted are:

Electricity provides 1368 B.Th.U. per 1d.

so	$\frac{857{,}143}{1368}$	= £2 12s. 2d.
with gas	1,000,000	= 10 therms
	10×1s. 1d.	= 10s. 10d.

At these prices electricity costs 4·8, or nearly five times gas for the same cooking duty.

In gas and electricity we have the ideal cooking fuels, as both provide service (without labour to the cook), continuous duty (with very little attention by the cook), and offer almost a maximum cooking efficiency at any moment by just the turn of the tap or switch; supplying all these advantages without causing any ancillary work (such as bringing supplies of fuel, cleaning flues, and removing ashes) which inevitably follows the use of solid fuel, and, what is even more important, without depositing a film of dust in the kitchen, or a cloud of soot in the air for poor suffering humanity to breathe, to the detriment of their health.

The Slave of the Fire.

On the other side of the picture is our ancestral grandmother laboriously making her fire. We can imagine her on her knees slowly coaxing the spark to flame, and then as slowly and laboriously persuading the fire to reach a cooking efficiency. Surely we have reason for congratulation on the obvious improvement in cooking fuels.

With these facts before us, it is not being too optimistic to prophesy that only the essence of coal will in the future be used as cooking fuel. I will not ask you to endorse my platitude that woman's improved position is connected with anything so unromantic as fuel; but I feel sure that you will agree that woman does obtain complete emancipation from kitchen slavery by the introduction of the essence of coal as the cooking fuel.

Gas Supply in Lanark Middle Ward.

At a meeting of the Committee on Gas Supply in the Middle Ward of Lanark, it was agreed to put forward to the Unemployment Grants Committee proposals amounting to £63,500 for the laying of about 20 miles of high-pressure gas-mains throughout the district, which would afford employment to probably 1000 men; and it was stated that the Consulting Engineer, Mr. W. Doig Gibb, had subsequently approved of the proposals. He further reported, however, that intimation had since been received from the Unemployment Grants Committee that, owing to the limitation of funds, date of commencement of work, &c., they were unable to make a grant in connection with the scheme. The District Committee unanimously approved of the proposals, and agreed that the Government should again be approached on the matter, and every endeavour made to obtain a grant. At another meeting of the Gas Supply Committee, the Clerk reported that he had received a further communication from the Unemployment Grants Committee, in answer to his representations, to the effect that, things having altered somewhat, they were prepared to consider the applications which had been put forward. The meeting thereafter went carefully over the proposed extensions. The Works Manager was also heard at length as to the capacity of the Uddingston works to supply additional areas. He stated that, in addition to Bellshill, the Uddingston works were capable of supplying the present needs of Holytown, Blantyre, and Larkhall with a considerable margin of safety, provided the purifiers at the Bellshill works were removed and installed at Uddingston, and additional exhausting plant erected. He also stated that, should an extra bench of retorts be erected, and some alterations and additions be made to the coal-conveying plant, the works would be capable of supplying the whole Middle Ward area, with the exception of Cambuslang. The Clerk said, in view of the recommendations now made, he would prepare and submit statements and data, as far as he possibly could, with the information he had, on the financial aspect of the question in relation to each of the proposed extensions, and the probable effect they would have on the price of gas in the districts that would be supplied. The meeting approved.

NORTH MIDDLESEX GAS COMPANY.

Success of Co-Partnership.

The Meeting of the Company was held on Monday of last week, at No. 5, Great Winchester Street, E.C.—Mr. A. M. Paddon presiding.

The Secretary (Mr. E. L. Burton) read the notice convening the meeting; and the report and accounts for the past year were taken as read. The report stated that, in comparison with the year 1920, the sales of gas showed an increase of 10,321,700 c.ft., or 2·3 p.ct. The profit for the year (including interest received), after charging interest on debenture capital and temporary loans, income-tax, &c., amounted to £10,849, which, with £3551 brought from the previous year, made the disposable balance £14,400. The Directors paid interim dividends of £2 10s. p.ct. on the preference stock, £3 15s. p.ct. on the original ordinary shares, and £2 12s. 6d on the additional ordinary shares (all less income-tax); and they now recommended the declaration of final dividends for the year of £2 10s. p.ct. on the preference stock; £7 5s. p.ct. on the "original" ordinary shares; and £5 1s. 6d. p.ct. on the "additional" ordinary shares, all less income-tax. The interim and final dividends amounted to £10,747, leaving £3653 to be carried forward to the credit of the profit and loss account for the current year. In response to the Company's application under section 1 of the Gas Regulation Act, the Board of Trade issued an Order which prescribed a standard price of 1s. 4d. per therm for the gas supplied by the Company, and annulled the old standard price of 4s. 3d. per 1000 c.ft. The Directors gave the prescribed notice that as from Nov. 12 the declared calorific value of the gas they intended to supply was 450 B.Th.U., the charge to consumers being 1s. 1½d. per therm. The Directors have given notice of a reduction to 1s. 1d. per therm, to take effect from Christmas last. The Order for which application was made to the Board of Trade under the provisions of section 10 of the Gas Regulation Act was issued on Aug. 17. The Order authorized the holding of an annual general meeting instead of half-yearly meetings as hitherto, empowered the Directors to declare and pay interim dividends, and incorporated other enactments based upon the legislation of the past few years.

The Chairman, in moving the adoption of the report and accounts, said he was sure the briefest examination would convince the proprietors that the statement presented was eminently satisfactory. Perhaps, however, a little comment and explanation were called for, not only by virtue of the fact that the accounts referred to a whole twelve months, but also by reason of the very important incidents that had occurred since the last meeting. With regard to capital, which was an increasingly important matter in these days, the total amount issued was equal to about £560 per million cubic feet of gas sold. This was a low figure, standing by itself; but when one realized that the Company had been spending capital at a considerable rate during the last few years, and that capital expenditure had now practically terminated, the figure had a new significance. The plant had been largely increased; and the mains throughout the district had been enlarged, and where necessary restored, to meet the changing conditions in the supply of gas. The increase in the sale of gas, though not large, was reassuring. By a somewhat extraordinary coincidence, the profit came within £1 of what it was a year ago. The repair, maintenance, and renewal of both plant and distributing system had been fully provided for. The epitome of the whole matter was that, after paying dividends restored to their pre-war dimensions, and every other charge, they would carry forward just over £100 more than was brought into account. There would be a still further reduction in the price of gas, which would be, as from March 31, 1s. 0½d. per therm—a very favourable selling price. The money devoted to co-partnership was nothing compared with the benefits the Company had received by the adoption of the scheme. Though co-partnership had been so great a success with them, there was this to be said about it—that, like other good things, it depended upon the energy, the honesty, and the earnestness with which it was applied. There could be no better example of what co-partnership could do if so applied than the experience of their own Company. He was perfectly certain that the Directors never inaugurated a better industrial policy than when they introduced co-partnership into the works of the Company.

The report and accounts were adopted; the dividends recommended were declared; and the retiring Director (Mr. Paddon) and Auditor (Mr. L. Hardy) were re-elected.

The Chairman, proposing a vote of thanks to the officers and staff, made acknowledgment of the exceptional skill displayed by Mr. Lawrie Trewby (the Engineer and Manager) and Mr. Burton. He mentioned that the production of gas was 73 therms per ton from the coal that was now being used. This result did infinite credit to Mr. Trewby and the staff under him.

Mr. A. F. Phillips, in seconding, also spoke of the excellent manner in which the work is carried out at Mill Hill.

Mr. Burton and Mr. Trewby responded—the latter remarking that he had been nearly twenty years Engineer to the Company; and the last two years, under co-partnership, had been years of absolutely perfect happiness. The good results were entirely due to the men pulling together.

English Coal for Ghent Gas-Works.—The Brussels correspondent of "The Times" reports that the Ghent Gas-Works have placed a large contract for coal with a British firm, who have been able to offer English coal at about 5s. a ton less than the price asked by Belgian collieries. The price includes delivery at the gas-works.

Brynmawr and Blaina Gas Company.—Lieut.-Col. J. G. Bishop, O.B.E., presenting the statement of accounts for the year ended December last, which showed a profit of £1308, said the Company had passed through a very trying and difficult year. The cost of coal, wages, and other material now showed a downward tendency; and they had reduced the price of gas 6d. per 1000 c.ft. as from Jan. 1, which would mean a saving to the consumers of £1000 per annum. Dividends of 5 p.ct. on the preference stock and £3 19s. 4½d. p.ct. (both less tax) on the ordinary stock were declared.

SUNDERLAND GAS COMPANY.

Low Price Charged.

The Chairman of the Sunderland Gas Company (Alderman W. F. Vint), at the annual meeting, said the price of gas was to be further reduced as from the present meter readings by 3d. per 1000 c.ft. The sale of gas showed a decrease, due to the coal dispute and the general depression in trade, especially during the latter half of the year; but the Directors realized the necessity of producing and selling gas as cheaply as possible, and during the year they had reduced the cost to the consumer from 4s. to 3s. 9d. per 1000 c.ft. for ordinary purposes, and to 3s. 7d. for power. Even this price was the lowest in the district, without the further reduction of 3d. which was to take effect almost immediately. Coal, oil, dues, &c., had cost £164,164, equal to 2s. 1d. per 1000 c.ft. of gas produced; but this was a decrease below the previous year of £52,886, due principally to the lower price of coal. The wages bill included under the various heads £104,584, equal to 1s. 4d. per 1000 c.ft., against £113,753, or 1s. 5d. per 1000 c.ft., a year ago, and £34,644, equal to 6¾d. per 1000 c.ft. in 1914. On the other side of the accounts, the return from private lighting at £196,587 showed the large increase of £87,427, due to the fact that it was found necessary to raise the price of gas at the beginning; but out of this they had to contend with an additional cost of £9000 as a result of the coal strike, and a serious fall in the market for residuals. The Company were extremely fortunate in having such large stocks of coal on hand at the time of the strike. They had prepared for that emergency, and the £9000 was a very small figure compared with the cost to other undertakings in the district. To sum-up the year's working, the expenditure was £316,367, a decrease of £66,674; while the income was £327,010, a decrease of £68,797. The balance of profit was £10,642, which was not sufficient to pay the maximum dividend for the year without calling upon the divisible profits carried forward. It was unique to have to call on the divisible profits to assist the dividend; but when it was remembered how unprecedented the year was in regard to burdens on the finances of the Company, they must consider it a matter for satisfaction that their finances had stood the strain so well. An interim dividend was paid of 3 p.ct. on the ordinary stock; and the Directors now recommended a like dividend. This would leave a divisible profit to be carried forward of £8328.

The report was adopted.

BELFAST GAS UNDERTAKING.

At the Belfast Corporation meeting on the 1st inst., Alderman Boyd (the Chairman of the Gas Committee) gave an assurance that there would be a reduction in the price of gas at the end of the financial year—viz., in April. He said that, owing to the big reduction in wages and the general want of employment, there was a strong feeling that a reduction should be made; but it was only fair to the Gas Department that certain facts should be elucidated. They had fought their way through the coal strike, and obtained supplies from foreign sources at a big price, which involved considerable loss to the department; and, notwithstanding the exigencies of the period, they had not increased the price to the consumer. The Committee stood by the public when the public required assistance. He claimed that the supply was second to none in the kingdom, and that it was as cheap as, if not cheaper than, that in a great many British cities. They would have the gas undertaking in a thorough financial position at the end of the financial year, and, while giving the usual relief to the rates of £11,400, would be able to give consumers a reduction. He thought the time had arrived when they should acquire power to extend the distribution of gas to further outlying districts.

Exeter Gas Light and Coke Company.

Presenting at the annual meeting the accounts for the year 1921, the Directors reported that the sale of gas had again increased by nearly 14 million c.ft. The Board of Trade had made an Order, under the provisions of the Gas Regulation Act, fixing the standard price of gas at 16·8d. per therm; and the calorific value of gas had been declared at 475 B.Th.U. The Board recommended the payment of dividends for the year of 10 p.ct. per annum on the original stock and 7 p.ct. per annum on the new ordinary shares—less income-tax. The Chairman (Mr. G. Hardy Harris), proposing the adoption of the report, said the past year had been very satisfactory. In 1898 the Company's output was 220 million c.ft.; and in 1920 it was 502 millions. In the seven years from 1913, their increase had been no less than 121 millions. While the cost of labour increased by 300 p.ct., and coal by 250 p.ct., that of gas had only increased by 100 p.ct., and no addition had been made since 1919. Their present price was equivalent to 4s. 3 3d. per 1000 c.ft. The policy of the Board during the last few years was the main cause of the continuous prosperity which had followed the Company. In the best times they did not distribute their earnings up to the hilt. They had maintained their works in a high state of efficiency, and all renewals had been made by improved and labour-saving appliances. They had not increased their capital, and therefore had not to increase the drain on the surplus available for dividend. During 1921 they had made very considerable improvements in their gas distribution plant. The profit on the revenue account was £8407. He paid a high tribute to the work of the Secretary and Manager (Mr. W. N. Westlake) and the staff.

No Import Duty on Calcium Carbide.—Judgment has now been given by the Referee under the Safeguarding of the Industries Act, in the matter of the complaint by the British Cellulose and Chemical Manufacturing Company, Ltd., that calcium carbide has been improperly excluded by the Board of Trade from the lists published by them of articles chargeable with duty under Part 1 of the Act. The award is that calcium carbide is properly excluded from the list published by the Board of Trade.

BRENTFORD GAS COMPANY'S FINANCES.

The first article of the "Joint-Stock Companies' Journal" for March 1 is devoted to a lengthy examination of the figures for the past few years of the Brentford Gas Company, and the effects of the war. It is the first of a series of articles the intention of which is to examine the affairs of representative gas companies of London and other cities and towns, and by analysis of figures to bring out the main facts which determine the investment value of the shares.

The writer says that the growth of the Brentford Gas Company (which is the third largest concern of the kind in the Metropolitan area, ranking next after the Gas Light and Coke Company and the South Metropolitan Gas Company, and is the seventh in the whole kingdom) is readily proved by the quotation of pre-war, mid-war, and post-war figures. In 1913 there were 105,847 consumers; and the sales of gas were 3,351,605,000 c.ft. In 1916 there were 119,412 consumers, and 3,921,063,000 c.ft. were sold, which in 1920 became 4,501,303,000 c.ft., the number of consumers being 124,093. At the end of last year, the latter figure was 125,612; and in spite of trade stagnation and the prevalence of terrible unemployment, the sales of gas were almost maintained. To be precise, they amounted to 4,438,461,000 c.ft. Sales were checked, undoubtedly, by the high cost of gas, to which the coal strikes of 1920 and 1921 contributed in a serious degree. But the essential fact remains that in spite of the cost—which is more than twice what it was in 1913—there are more households using gas, and in more ways, than before the war; and the time is long past when even the humblest house is erected in an urban area without being piped for gas supply. The effect is the establishment of a much broader and deeper foundation of goodwill; and in a sense it is material goodwill, for the mere fact that gas-pipes are in, and that the substitution of electrical fittings means a big capital cost, helps to make gas supply permanent. But its main strength lies in its convenience, cleanliness, and healthiness.

Referring to an analytical table given covering the years 1915 to 1921 inclusive, it is remarked that the first point which emerges is that the proprietors received only as much in dividend for 1921 as they did for 1915, while the gas consumers spent almost three times as much. As between these years, the coal bill increased by well over 150 p.ct., and the wages item was multiplied by considerably more than three. Rates and taxes all but doubled; management (as to half which consists of collectors' remuneration) was more than doubled. But while the consumer will see that his woe is not the proprietors' gain, though the profit of the latter improved by 50 p.ct. or so, the condition as compared with 1920 is far better from the point of view of both classes. There were events last year, mainly the coal stoppage, which made the results far less good than they would have been in regard to the price of gas and the profits of the Company; but the tendency is towards cheaper material, cheaper gas, restored markets for residuals, and larger profits for the proprietors. The corner was distinctly turned by the whole industry last year by legislation, finance, and the altered basis of values generally; and the Brentford Gas Company is one of those eminent members of the industry which must reflect the present improvement as clearly as it revealed the disadvantages of the last half-dozen years.

TRADE NOTES.

Waller's Exhausting Machinery.

A new and very comprehensive catalogue dealing with exhausting machinery and accessories is to hand from Messrs. George Waller and Son, Ltd., of Stroud, who have specialized in this class of work since the year 1860, and whose machinery is in use throughout the world, on gas-works, coke-oven bye-product plants, chemical works, &c. As far back as 1854, the firm made exhausters of the early reciprocating type; and in 1861 they commenced the manufacture of the original Beale two-blade rotary exhauster, the supply of which was continued until 1879, when they patented and introduced their three-blade rotary machine. Since that time, over 2000 exhausters of this and the four-blade type (patented in 1886) have been supplied. In the catalogue, the advantages claimed for these three and four blade exhausters are enumerated; and there are some notes on exhauster design and manufacture. Useful illustrations are given of standard arrangements of machinery and connections for some of the firm's different types of exhauster plant—these illustrations having been prepared from plans of actual installations carried out by them. There is also a great number of illustrations of the exhausters themselves, including combined sets for small works, fan-type exhausters, &c. Steam and gas governors and valves made by the firm are also described.

Great Yarmouth Carbonizing Results.—A reduction as compared with the previous year of approximately 3 p.ct. in the sales of gas for 1921 was experienced by the Great Yarmouth Gas Company. This was stated by the Chairman (Mr. T. A. Rising, J.P.) at the annual meeting to be due to the great amount of unemployment in the early part of the year, and the failure of the fishing in the latter part. During the holiday season there was a substantial increase in sales. Though they had carbonized over 3000 tons less coal and produced practically the same amount of gas, the coke sold was only 558 tons less than in the preceding year, owing to the improved carbonizing plant. This figure would have been still better but for the inferior coal (which produced little saleable coke) it was necessary to use during the miners' strike. Two reductions had been made in the price of gas (amounting in all to 1s. per 1000 c.ft.); and the Board had every confidence, as the result of the improved methods of production, and the general fall in coal and wages, that they would be able to make further substantial reductions at an early date. It was a source of great satisfaction to them to be able to recommend the maximum dividend allowed by their Act. Mr. P. D. Walmsley (the Engineer and Manager) said he did not think there was any doubt of their being able to maintain the dividend in the future. Their new plant had only been fully in operation half the year, and the coal strike wiped out all the advantages they obtained from that portion of the plant at work in the first half of the year.

Wakefield Gas Light Company.

The 141st ordinary general meeting of the Wakefield Gas Light Company was held at the Company's offices, Warrengate, Wakefield, on Monday, Feb. 27. Alderman G. A. Moorhouse, J.P. (Chairman of the Company), in presenting the Directors' report, stated that the year 1921 was the most anxious in the history of the Company, owing to the disastrous and prolonged coal stoppage. This caught the Company at a great disadvantage, as they had not had time to replenish their stocks of coal from the previous strike, which terminated in November of the preceding year. They had to carbonize the refuse from pit-heaps, procured at ruinous prices; but they managed to maintain a useful supply of gas throughout the stoppage, though at such a cost as to make it impossible to pay even the meagre dividend authorized by the (Temporary Increase of Charges) Act, 1918, without taking £1683 out of the carry forward, reducing it to £1007. The Company were daily expecting their Order to be granted under section 1 of the Gas Regulation Act, 1920. This year marked the centenary of the Incorporation of the Company; the Act of Incorporation having received the Royal Assent on April 3, 1822. The original foundation stone (now built into the retort-house) bore the date Sept. 8, 1822. There was an increase in the amount of gas sold during the past year of 980,500 c.ft., notwithstanding the prolonged coal stoppage. The Directors were looking forward to an early reduction in the price of gas, and to a more favourable year's trading, if nothing unforeseen occurred.

Watford Gas and Coke Company.

Mr. E. J. Slinn presided at the annual meeting of the Company, when the Directors' report for the past year was adopted, which stated that gas was now being sold by therms, at a declared calorific value of 475 B.Th.U. The standard price had been fixed at 17·8d. per therm. The sale of gas and residuals showed a slight decrease on the previous year. There was a profit on revenue account of £15,992, and on the profit and loss account a balance of £6003, after providing for interest and interim dividend. The dividends declared were, on the "A" capital stock at the rate of £6 8s. 9d. p.ct. per annum, and on the "B" capital stock at the rate of £4 18s. 9d. p.ct. per annum, less income-tax. The Chairman said there was a fair increase shown in the dividends for 1921 as compared with previous lean years. This increase the Board trusted was a beginning of better days; and possibly before long they might find themselves back to the dividends of 1914, if not to something better. The price of gas was high during the latter part of the year; and though they found it possible to cancel part of the increase made owing to the strike, they were only now beginning to make definite strides in further reductions. Since the meter readings in January, a decrease of 1·2d. per therm, equal to nearly 6d. per 1000 c.ft., had been in force. This would be followed shortly, he hoped, by a further substantial reduction. During the year they had lost by death their late General Manager and Secretary, Mr. J. D. Royal, who served the Company ably over a period of 24 years. He was sure they would wish him to place on record their appreciation of Mr. Royal's services. They were fortunate in having a successor as Secretary in Mr. George Wilks, who had been Mr. Royal's understudy for many years.

Satisfactory Working Results at Sutton.

The report submitted at the half-yearly meeting of the Sutton Gas Company revealed satisfactory working results for the past half year; the revenue account showing a balance of £5152. After carrying £500 to the renewal fund, there was a balance on profit and loss account of £9925, from which the Directors recommended the payment of a dividend at the rate of £5 7s. 6d. p.ct. per annum (less income-tax) for the six months. The Company have been granted an Order under the Gas Regulation Act fixing a new standard price of 14·6d. per therm in the Sutton and Cheam limits, and 15·8d. per therm in the Worcester Park and Banstead limits. Consumers have been notified of a reduction in the selling price of gas, equivalent to 1d. per therm, and the present prices are: In the Sutton and Cheam area, 1s. 1d. per therm; in the Worcester Park area, 1s. 1⅛d. per therm; in the Banstead area, 1s. 2⅛d. per therm. The Directors deeply regretted to have to record the death, in October last, of Mr. Stephen Carpenter, the Engineer and Manager, who for a period of 46 years had devoted himself wholeheartedly to the Company's interests. Having regard to his long and valuable services, the Directors had voted his widow an annuity of £200. The position of Engineer and Manager has been filled by the appointment of Mr. Henry Gage, Assistant Engineer and Manager of the Rochester, Chatham, and Gillingham Gas Company. Alderman Holland (the Chairman), referring to the late Mr. Carpenter, said his ability and great practical experience, his sterling character, kindly disposition, cheerfulness of outlook even in trying circumstances, and his whole-hearted devotion to the Company's interests, made them all hold him in high esteem, not only as an official, but as a friend. The price of 13d. per therm compared favourably with that of other companies. Capital would be required for extensions of works consequent upon increase of business. Mr. J. Ferguson Bell congratulated the Directors upon the distinctly successful manner in which they had conducted the undertaking during the past half year. The report was adopted.

Fine for Embezzlement.—Frank Boyer, a gas-fitter in the employment of the Rhymney and Aber Gas and Water Company, pleaded guilty at Bargoed Police Court to embezzling £15 3s., the property of his employers. It was stated that the prisoner, who gave himself up to the police in London when he had only a half-penny left, was given instructions by the foreman to attend to some meter defects. He went to the house of a customer and collected from a shilling slot-meter the sum mentioned in the charge. The customer later wrote asking whether she was to receive any discount; and this was the first intimation the Company had that the meter had been cleared. Prisoner, who said he was willing to refund the money if given the opportunity to do so, was fined £5.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 6.

In the London products market pitch continues a strong feature, and the price is firm at between 75s. and 80s. per ton; makers being very fully committed, and not at all anxious sellers. Creosote is steady at about 6¼d. to 6½d. per gallon in bulk. Solvent naphtha is rather a weak market; the price being in the neighbourhood of 2s. 9d. per gallon, net. Pure benzole and pure toluole are about 3s. 3d. per gallon. Pyridine bases is in more demand; the price being steady at about 6s. per gallen filled into buyers' drums.

Tar Products in the Provinces.

March 6.

The average values for gas-works products during last week were: Gas-works coal tar, 35s. to 40s. Pitch, East Coast, 75s. to 77s. 6d. f.o.b. West Coast—Manchester, 70s. to 72s. 6d.; Liverpool, 70s. to 72s. 6d.; Clyde, 72s. 6d. to 75s. Benzole 90 p.ct. North, 2s. 1d. to 2s. 2d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 1d. to 2s. 2d. Toluole, naked, North, 2s. 2d. to 2s. 5d. nominal. Coal tar crude naphtha in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 4d. Heavy naphtha, North, 2s. 1d. to 2s. 3d. Creosote, in bulk, North, liquid, 4½d. to 4⅝d.; salty, 4½d. to 4⅝d. Scotland, 4⅛d. to 4¼d. Heavy oils, in bulk, North, 6d. to 6¼d. Carbolic acid, 60 p.ct., 1s. 8d. to 1s. 10d. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

There is very little change in the position, except in the case of pitch, which remains fairly strong and quite a healthy market. The still high prices of coal and the lower prices for slack are in favour of the briquette manufacturers; and they should be able to pay a fair price for pitch. Benzole is quiet and on the cheap side, owing to rumours that lower prices will shortly be quoted for petrol. The demand for solvent naphtha is steady; but there is no change in prices, which remain at 2s. 6d. to 2s. 8d. per gallon. The supply is certainly only moderate; but is increasing as more coke-ovens go into operation; and it may be that, with no revival of demand from the rubber manufacturing trade, supplies will increase so far that a reduction in price will be necessary. The market for naphthalene remains very dull; refined being £17 to £19, and crude £5 to £6 per ton. A fair business is being done in the latter by the firelighter industry. There is no change in carbolic acid, although some makers report selling small parcels at 1s. 9d. per gallon. As a rule, however, with crystals at 5½d. per lb., manufacturers cannot afford to give more than 1s. 6d., at which price it does not pay to produce. Creosote is an easy market at 4⅝d. to 5d. per gallon. A little business has transpired in intermediate products, with a fair amount of export inquiry. Aniline oil and salt are slightly cheaper at 1s. and 1s. 1d. per lb. respectively. Salicylic acid, technical, is 1s. per lb., resorcin 6s. per lb, and beta naphthol 2s. per lb.

Sulphate of Ammonia.

The position in sulphate of ammonia has undergone practically no change. Quantities are now coming into consumption for home agricultural uses, and there are also very fair inquiries from abroad. Supplies are improving with the return to work of the coke-ovens, but as yet the demand is somewhat in excess of the supply.

Gas Supply of Bridgend.—The report of the Directors of the Bridgend Gas and Water Company for the year ended Dec. 31, states that the expenditure on capital account was £3272, and includes the installation of a complete Tully gas plant, with house for same; also a Cornish boiler and an additional exhauster. This expenditure has been incurred with a view to the more economical production of gas in the future. The revenue accounts, unfortunately, show a loss on the year of £1260. The extra cost of high-priced and inferior coal during the strike, and the heavy charge for labour, account for the loss in the gas department. In accordance with the provisions of the Mid-Glamorgan Water Act, 1921, the water undertaking of the Company was transferred to the Mid-Glamorgan Water Board as from Jan. 1 last. The Directors look forward with confidence to an improvement in the affairs of the Company during the current year, when the new plant and the falling cost of labour and materials are bound to have a beneficial effect.

Halesowen Gas Company.—The annual meeting of the Company was held recently, when the statement of accounts for the year ended Dec. 31 showed that the profit (after payment of debenture interest, &c.) amounted to £895, which sum added to the amount brought forward, gave a total of £2840. The Directors recommend the payment of a final dividend of 10 p.ct. per annum on the "A" shares, and 7 p.ct. per annum on the "B" shares (less income-tax). In presenting the report, the Chairman (Mr. G. F. Grove) stated that the past year had been most difficult and trying for the Company; but they kept all their customers supplied. This was accomplished partly by purchasing foreign coal at an enormous price, which considerably reduced the profits. The management had not only maintained the output of gas, but had increased it considerably, and at the same time given a better quality and a higher pressure than ever before. There were few gas companies who had come out of the year just ended so well as the Halesowen Company.

A Bonus for Meter-Repair Men.

With a view to increasing the production of their meter shop, the Boston (U.S.A.) Consolidated Gas Company twelve months ago instituted a new method of remuneration which has worked out satisfactorily, not only to the management, but to the employees. Under this scheme, the basis of pay is the regular wage, *plus* a monthly bonus, which is arrived at in the following manner: Calculate what it would have cost to have this work done according to "standard prices" of repair shops, multiplying each size meter by the "standard price" for the particular work done on that meter—such as oiling or new diaphragms. This amount would be the "standard cost." Compared with this would be the actual cost each month, taken from the pay rolls and disbursement tickets covering the materials used. The difference between the actual expense for the month and the cost at standard prices would represent the saving or loss to the Company for the month. This amount, if a saving, is divided by two; one-half to go to the Company, and the other half to be divided among the employees of the meter shop as follows: The employees' proportion of the savings for the month is divided by the total pay roll of the meter shop for the month; the resulting figure being the cents saved per dollar of wage expense. Each man's wages for the month are then multiplied by the cents saved per dollar, to determine the amount due to each individual. If during any month the cost is more than the "standard cost" arrived at as described, then this over-cost has to be absorbed in the succeeding month or months before a bonus can be divided. The success of the plan depends upon the co-operation of superintendent, foremen, and workmen; and in order to obtain this co-operation, there was a Committee formed to meet regularly for considering suggestions and discussing matters generally. While originally put into operation as a test, the plan has proved so satisfactory that it is now regarded as a permanent arrangement.

Union Seize the Tipperary Gas-Works.—It is reported that the Tipperary branch of the Transport Workers' Union gave notice that the Tipperary Gas Company having refused a demand for the payment to all their employees of the rate of wages prevailing in the North, and two of the employees having been dismissed, the workers would take over the concern and run it in the interest of the citizens. They issued a proclamation stating that the demand was originally presented in November last; and that, though it was refused by the Company, negotiations were continued with a view to avoiding a strike. The men took over the gas-works on Saturday morning, hoisted the red flag, dismissed the Manager, and installed in his place one of the employees recently dismissed.

Gibbons (Dudley), Ltd.—The 27th annual report of the Directors, to be submitted at the meeting next Monday, states that the year ended Dec. 31 last was one of great anxiety, arising not only from the disastrous coal strike, during which the Company's mines were flooded, causing serious damage to the workings, but also from the slump in trade during the latter part of 1921. The net profit for the year, including dividends from subsidiary companies, after providing for corporation tax and depreciation, is £24,329, which, added to the amount brought forward from last year, makes a total of £32,369. Of this, the full preference dividend, the interim dividends of 7 p.ct. per annum on the ordinary shares, and the dividend of 7 p.ct. per annum on the short-term capital, already paid (all free of income-tax), absorbed £13,867, leaving to be now dealt with the sum of £18,502. The Directors recommend that a dividend of 3 p.ct. per annum, free of income-tax, be paid upon the ordinary capital, from the dates of payment, which, with the interim dividends already paid, will make a total of 10 p.ct. for the year.

Increased Sales at Ilfracombe.—At the annual meeting of the Ilfracombe Gas Company, Mr. R. M. Lowe (the Chairman of Directors) presiding, it was reported that the profit and loss account showed an available balance of £2086, after paying an interim half-yearly dividend of 2½ p.ct. on the preference stock and 1¾ p.ct. on the consolidated ordinary stock. The Directors recommended a further payment of 2½ p.ct. on the preference stock and 2½ p.ct on the consolidated ordinary stock. The present price of gas of 1s. 5d. per therm represented an approximate reduction of 9d. per 1000 c.ft., calculated on the basis which obtained before the Company secured their Order under the Gas Regulation Act. It would be the aim of the Directors to endeavour to effect a further reduction as early as possible. The sale of gas continued to increase. The installation of the retort-house machinery had during the past year been completed, and was working satisfactorily. The powers possessed by the Company by virtue of the consent obtained from the Board of Trade under the Public Utility Companies (Capital Issues) Act, 1920, had been successfully exercised by the Directors. The report was adopted.

Effect of the Coal Strike at Crowborough.—The report presented to the shareholders at the yearly meeting of the Crowborough and District Gas Company, presided over by Mr. George W. Howard, F.C.S. (the Chairman), stated that the coal stoppage in the early part of the year involved a loss in profits on the year's working of over £1000. In spite of the curtailment of supply, the quantity of gas sold during the year had increased by 3 p.ct. A new carburetted water-gas plant was brought into operation on Jan. 2 last. The revenue account showed a profit of £1944 for the twelve months. To this had to be added the amount brought forward from last year, £3749; making a total of £5694. Debenture and bank interest amounted to £1184; leaving £4510 available for dividend. The Directors recommended a dividend of 2¾ p.ct., which would absorb £712; leaving a sum of £3797 to be carried forward. The Chairman, in moving the adoption of the report and accounts, referred to the issue of £9970 8 p.ct. redeemable preference stock, and said it was hoped to issue the remainder of the £15,000 early this spring. There had been an extension of the mains and services, and an increase in the number of customers. They expected to be charging by the therm from the end of the present quarter, and anticipated that the new price would represent a reduction in the cost of gas. The Directors were considering a scheme for the supply of electricity. The payment of the statutory dividend would be permissible at the end of the present year.

Increased Output at Dorchester.—The accounts which the Directors were able to present for the year 1921 were of a satisfactory character; there having been a further increase in the sales of gas amounting to 2,683,600 c.ft. A dividend was recommended at the full statutory rate at the present price charged for gas—namely, at the rate of 6 p.ct., less income-tax.

Aberdare and Aberaman Gas Company.—Mr. Charles Kenshole presided at the one hundred and fifth half-yearly general meeting of the shareholders of the Aberdare and Aberaman Gas Company. The accounts for the past year were adopted, and a dividend declared of 4 p.ct. upon the original ordinary shares and £2 16s. p.ct. upon the new ordinary shares, less tax. Considering all the adverse circumstances prevailing throughout the year, the report was regarded as very satisfactory. The Company have made an application for an Order under the Gas Regulation Act, and will be charging for gas upon a thermal basis during the present year. Reference was made to the loss the Company had sustained by the death of the late Chairman, Mr. D. P. Davies, J.P., who had served them for thirty-six years.

Favourable Outlook at Chichester.—The half-yearly meeting of the Chichester Gas Company was held on the 28th ult.—Mr. W. A. Walker presiding. The report for the half year ended Dec. 31 stated that the relief given by the Gas Regulation Act, 1920, was reflected in the accounts, which showed a profit of £2727, and enabled the Board to propose a distribution of 10 p.ct. on the "A" stock and 7 p.ct. on the "B" and "C" capital stocks, all less income-tax, which were the maximum dividends allowed by the Company's Acts. The balance standing to the credit of the Company on the profit and loss account (net revenue) amounted to £3754, which, after paying the dividends as recommended, would leave a balance of £2187 to be carried forward to provide for interest on the debenture stock and temporary loans which would become due on June 30 next. The cost of coal used during the half year totalled £5918, and the cost of oil, coke, &c., for the manufacture of carburetted water gas £967. The introduction of the new plant for water-gas manufacture had been found to be economical, and of the greatest convenience. The gas made in the half year had amounted to 32,682,000 c.ft., compared with 33,785,000 c.ft. for the corresponding half of last year—a reduction of 1,103,000 c.ft. The gas sold, however, was 30,090,000 c.ft,, as against 30,920,600 c.ft., or a reduction of only 830,000 c.ft., the difference being 272,500 c.ft., which was a saving on the quantity of gas unaccounted for. The receipts for gas totalled £12,733, compared with £12,363—an increase of £370; rentals of meters, stoves, and fittings showed an increase of £188; sales of residual products, a decrease of £1639—there having been a total slump in the ammonia market. In the aggregate receipts there had been a reduction of £1171; and the difference in the reduced income compared with reduced expenditure was £488. This increased the balance to be carried forward to the profit and loss account from £2288 to £2727. He regarded the outlook with confidence. The report and accounts were adopted.

A Promised Reduction at Manchester.—Alderman W. Kay (the Chairman of the Gas Committee) announced at last week's meeting of the Manchester City Council that after the close of the current financial year there will be a reduction in the price of gas. It is expected that this will amount to 4d. per 1000 c.ft. at least, and perhaps more. The continued fall in the price of coal and in the cost of production is naturally having a marked effect upon the financial position.

Whitby Gas Company.—At the annual meeting of the Company, Captain R. Smailes (the Chairman) said the past year had been one of the most anxious in the annals of the undertaking. The output of gas increased about 15 p.ct. At the commencement of the miners' stoppage, they had stocks of coal on hand sufficient for about six weeks' normal requirements; but they had to face an increase in output, owing to the extra demand for cooking, &c., amounting on some days to 120 p.ct. In order to conserve the stock, the Tully plant erected about eighteen months ago was worked to its utmost capacity. By the purchase of furnace coke and oil, they were able to maintain a full and unrestricted supply of gas during the whole of the strike period. The cost of manufacture was, however, considerably above normal. They were also able to supply about 300 tons of coke to the bakers and confectioners, hospitals, public institutions, and householders, who would otherwise have been without solid fuel during the major portion of the twelve weeks' stoppage. Dividends were declared at the rate of 3 p.ct. (less income-tax) on the original capital and at the rate of £2 2s. p.ct. (less income-tax) on the additional and new additional capital, for the half year ended Dec. 31.

Paying for the Coal Strike.—Addressing the proprietors at the 100th annual meeting of the Ipswich Gas Company, the Chairman (Sir Daniel F. Goddard) said that altogether the coal strike had resulted in a loss to the Company of £10,000, without taking into account the loss in business. Many of their industrial consumers had to close down, and consequently did not require gas. In the first quarter of last year, when there was no dispute, they were still increasing their output; but in the second quarter there was a decrease of 6 p.ct., and in July alone a decrease of 20 p.ct. Had they not lost this £10,000, they could have reduced the price of gas by 4d. per 1000 c.ft., so that every consumer in Ipswich had had to pay for the coal dispute. But notwithstanding all the difficulties of the dispute, they did not have to raise the price of gas. He could not say that all through the trouble they were able to keep a full supply, because at times the pressure was reduced a little; but they never had to cut-off the supply. He was struck by the fact that the Electric Lamp and Supplies Company were ordering more gas-radiators. They already had eight gas-fires, seven radiators, and two geysers. It did not look as if they put much faith in electricity for heating purposes. Then in all the new Corporation houses in Ipswich, though they had their own electricity supply, they had gas for cooking and for geysers. The prospects he regarded as very cheerful. Dividends were declared making, with the interim distribution, 12½ p.ct., 9⅝ p.ct., and 9⅛ p.ct. per annum on the "A," "B," and "C" stocks respectively.

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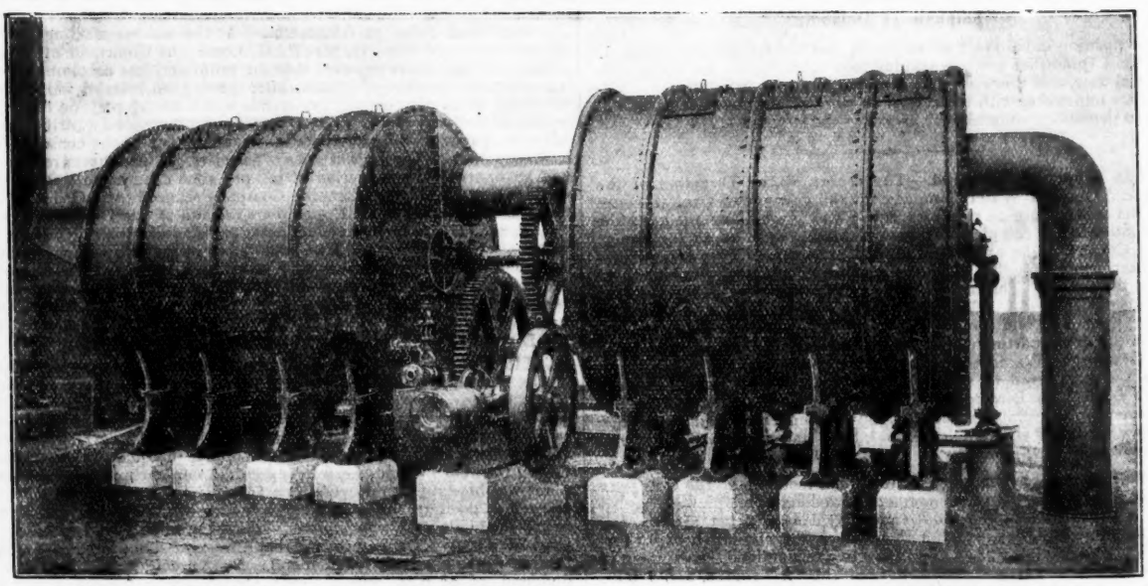

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Price of Gas at Airdrie and Coatbridge.—The Airdrie Gas Department have intimated that, as from the beginning of March, the price of gas in the burgh would be reduced 6d. per 1000 c.ft., making it 5s. It has also been announced by the Coatbridge Gas Company that a similar reduction will take place in the price of gas in that burgh. The new carburetted water-gas plant is now in full working order at Airdrie; and the new retorts at the Coatbridge works are also in full working order—both so far with satisfactory results.

Blackburn Gas-Works Extensions.—Among the schemes at Blackburn interfered with by the war was the proposal to bring the Greenbank Gas-Works up-to-date. The erection of new vertical retorts, decided upon in 1916, was only commenced two years ago, after Mr. G. P. Mitchell, the present Gas Engineer, had taken up his duties in the town. The task is now almost completed; and there is to be a formal opening on the 23rd inst. The retorts, 96 in number, are, in point of fact, now working. Several of them have been in operation during the last few months, and have given every satisfaction. The public have benefited by having a better and more regular supply than was possible with the old plant. The whole of the town's supply now comes from Greenbank; the old works at Addison Street having been closed-down. The formal opening coincides with two other interesting events—an exhibition of gas appliances, which opens on March 20, organized by the Gas Department; and a District Conference of the British Commercial Gas Association (Lancashire area), with which the Corporation are identified. At this conference special attention will be paid to the subject of smoke prevention—a question of special importance to a textile district like Blackburn.

Eastbourne Gas Company.—The half-yearly meeting was held on Feb. 27, Mr. Caleb Diplock (the Chairman) presiding. Mr. Frank H. Jones, in seconding the adoption of the report, said they met under happier conditions than last year, and had turned the corner. The worst feature was the price of gas. It was the earnest wish of the Directors and officials to get the price down as low as possible. Before the war, their price was lower than any other company in that district. The present price was twice as much as before the war, when coal was 19s. a ton, while to-day it was 52s. 4d. They had reduced the price by 1d. per therm, and hoped to reduce it again about June. For 1921, the consumption was very little less, and was nearly up to their biggest year, 1920. They were doing all they could by means of labour-saving devices to reduce their wages bill, as they felt it was their duty to produce gas as cheaply as possible. Great credit was due to the Directors and officials that they had been able to recommend a dividend which was within three-eighths of that of July, 1914; and they hoped that in August they would be able to recommend the same dividend as before the war. Practically every house on the mains was now connected. The report was adopted.

Dividend from Reserve at Leighton Buzzard.—The annual meeting of the Company was presided over by Mr. Robert Richmond, J.P. The report adopted showed that there was a balance on the revenue account of £611, and recommended a dividend of 5 p.ct., less income-tax. To provide the necessary £2093, the report concluded, would necessitate a heavy draw on the reserve fund. The Directors had every confidence, however, that the Gas Regulation Act had now placed the Company on a sound financial basis. The Chairman quoted from a long list of Orders which he had tabulated, and said that Leighton was the only town in the neighbourhood which had obtained an Order for 1d. per therm. He presumed that such a low price might be taken as a compliment to the management of the Company. He concluded with a description of the measures (in the shape of compressors) which were being taken to increase the pressure at Wing, Linsdale, and outlying parts. An extraordinary meeting followed, when the Chairman proposed (and it was agreed) that £7000 of 5 p.ct. consolidated ordinary stock should be created and issued. He said that their capital was very low in comparison with that of other companies, and that the money would be needed to replace with larger ones mains which had been down for many years, to meet the increased demands. The stock would be subject to the conditions of the price of gas, but he hoped that they would soon be able to reduce this; and there was no reason why they should not pay 6 p.ct. in the near future.

Gas Prices in Yorkshire.—The Halifax Corporation have approved a reduction in the price of gas for lighting and non-lighting, within and without the borough, by 6d. per 1000 c.ft., and agreed that the question of charges be further reviewed during the coming six months. An amendment for a shilling reduction immediately was defeated, though Alderman Broadley, in seconding it, alleged that the Gas Committee had been profiteering in their charges, using residuals as a rising and falling barometer. He criticized the buying of new plant out of revenue, and suggested that had the finances been relegated to the proper channel, instead of seeking to benefit future consumers, relief could have been given where it was most wanted. In replying, Alderman J. H. Waddington, the Chairman of the Gas Committee, said the Committee could not devote all profits to reducing the price of gas, but had to do something towards paying for the plant. The coal strike had cost an additional £16,000, but the consumers had not been asked for more money. The new price of gas is 4s. 6d.—The Leeds City Council have approved a recommendation of the Gas Committee for a reduction in the price of gas for all purposes by 3d. per 1000 c.ft., as from the last meter readings in March. Alderman G. Ratcliffe, the Chairman of the Gas Committee, admitted that there would be a deficiency of £80,000 at the end of March, owing to the coal stoppage and the loss of value in residuals. The plant was, however, working so well that it was hoped to wipe-out the deficiency during the next twelve months and effect a further reduction before long.—There has been much talk in the Bradford City Council lately as to a prospective reduction in the price of gas; but at a Gas Committee meeting last week no reduction was made. The price is less than the reduced charges in Leeds and Halifax, and the Committee propose to see how the department stands at the end of March with a view to possibly making a reduction with the beginning of the next financial year in April.—The Sowerby Bridge District Council have reduced the price of gas from 4s. to 3s. 6d. per 1000 c.ft. within the district, and from 4s. 7d. to 4s. outside the Council area.

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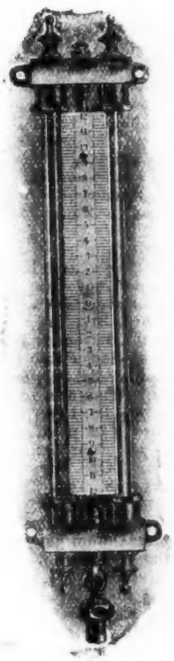

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Wires { "SAWER MANCHESTER." "SAWER NOTTINGHAM." "METRIQUE LAMB LONDON."

Cheaper Gas at Devonport.—At a meeting of the Plymouth Gas Committee (for the Devonport area), the Committee expressed their appreciation of the satisfactory result of the working of the undertaking during the year, and decided to make the following further reduction in the price of gas: From the Lady-Day readings, to ordinary consumers, from 4s. 2d. to 3s. 8d. per 1000 c.ft.; for power purposes, from 3s. 11d. to 3s. 5d. From May 1, to slot consumers from 16 c.ft. per penny, less a discount of 3d. per 1000 c.ft., to 16 c.ft. per penny, less a discount of 9d. per 1000 c.ft.

Messrs. A. & W. Richards have been instructed by the Directors to issue £70,000 of 6 p.ct. redeemable debenture stock in the Croydon Gas Company; the price being £98 per £100 stock, which is to be redeemed at par on July 1, 1932. This gives a yield, allowing for profit on redemption, of £6 6s. p.ct.

The Lytham District Council have decided to reduce the price of gas, as from April 1, by 4d. per 1000 c.ft. A shilling per quarter is also to be taken off the rents of cookers and gas-fires.

An inquiry was held at the Board of Trade Offices into an application by the Coatbridge Gas Company for power to issue £30,000 of additional capital. The matter was reserved for further consideration.

Damage was done by fire in the showroom in Sauchiehall Street, Glasgow, of the Corporation Gas Department. A volume of gas escaped from a meter in the basement, became ignited, and caused an explosion.

No decision has been come to as regards the proposed installation of vertical retorts at the Granton Gas-Works. Some members of the Committee are not convinced that this is the time to incur the expense of installation.

STOCK MARKET REPORT.

The course of things on the Stock Exchange last week was variable, realizations at one time hitting even the choicest lines, but firmness was established before the close. Home Government issues were higher, the big four on Friday marking thus: Consols 55⅛-56, War Loan 96 31/32-97, Funding 82½-83¼, Victory 85-86⅛.

Business in the Gas Market had another gay and active week. The London Companies were very firm at advanced figures. In the Suburban and Provincial group, Brentford, Ilford, South Suburban, Tottenham, Alliance and Dublin, Brighton and Hove, British, Maidstone, Newcastle, and South Shields made more or less considerable advances. In the remoter world, Imperial Continental rose steadily and closed with a rise of 7. European also added to its gains. Bombay gained ¼. Primitivas were stronger; and all shares and debentures in conjunction with Buenos Aires and River Plate were quoted higher. Monte Video rose 2.

Bargains done for cash during the week were as follows: On Monday, Brighton and Hove original 135½, Commercial 4 p.ct. 79¾, Croydon Bond "C" 150, 151, European 8 9/16, Gas Light ordinary 80⅛, 80⅜, 80⅜, 81, 81¼, 81⅛, 81¾, 82, ditto preference 69⅜, Imperial Continental 142, 143⅛, 144, 145, Primitiva 148., San Paulo debenture 37½, South Metropolitan 82, 82⅛, 82½, 82⅜, 83, 83⅛, ditto 6½ p.ct. debenture 104⅜, South Suburban debenture 79½, 80, Liverpool 7 p.ct. preference 105, ditto £30 paid 35½, Barnet 4 p.ct. debenture 70, Bournemouth 3 p.ct. debenture 49¼, 50. On Tuesday, Brighton and Hove original 148, 150, Commercial 4 p.ct. 78½, 79½, ditto debenture 54½, European 8½, 9, Gas Light ordinary 81, 81⅛, 81¼, 81⅜, 82, 82⅛, 83, ditto maximum 58, 58⅛, 58⅜, Ilford "B" 95, Imperial Continental 144, 145, 146, 147, 147⅛, 148, Liverpool 72⅛, 72⅜, ditto 7 p.ct. preference 104½-105½, ditto £30 paid 35¼-35½, Primitiva 155., ditto preference 42s. 6d., 43s., 43s. 9d., South Metropolitan 82⅜, 83, 83⅛. On Wednesday, Alliance and Dublin 62⅜, Commercial 4 p.ct. 79½, Croydon "B" and "C" 150½, 151, Gas Light ordinary 80⅛, 81, 81⅛, 81¼, 81⅜, 82, 82⅛, 82⅜, ditto maximum 58½, ditto preference 69⅜, ditto debenture 55½, Ilford "B" 100, Imperial Continental 146, 147, 147½, 148, 148⅛, 149½, Monte Video 58½, Primitiva preference 43s., South Metropolitan 82½, 82⅜, 83⅛, 83½, South Suburban 89⅜, 90, Croydon "D" 67⅞, Hornsey 5 p.ct. preference 77½, Liverpool 7 p.ct. preference 105½, ditto £30 paid 34½-35½, Peterborough 75. On Thursday, Alliance and Dublin 63, Bournemouth "B" 8 15/16, 9, ditto debenture 49¾, 50, Brentford "A" 84, ditto "B" 85½, ditto debenture 70, British debenture 62½, 70, European 8⅛, 8⅝, 9, Gas Light ordinary 80½, 81, 81⅛, 81 1/16, 81¼, ditto maximum 58⅜, 58½, Imperial Continental 146, 146½, 147, 147½, 148, 148⅛, 149, Monte Video 58½, Primitiva preference 45s., South Metropolitan 82½, Brighton and Hove 6 p.ct. preference 99½, 100. On Friday, Commercial 4 p.ct. 79, ditto debenture 56, Continental Union 18, European 8⅜, Gas Light ordinary 79½, 79⅝, 80, 80⅛, 80¼, 80⅛, 80⅜, ditto maximum 58½, 59, 59⅛, ditto preference 69, ditto debenture 55¾, Imperial Continental 147, 148, 148⅛, 148½, 148⅜, Primitiva preference 45s., ditto debenture 74½, South Metropolitan 82½, 83, 83¼, 83⅜, Tottenham "B" 80, 82, Liverpool 7 p.ct. preference £30 paid 35, Wandsworth 4 p.ct. debenture 66.

In the Money Market, the situation varied from time to time, easing in mid-week and finally closing firm. Discount rates also hardened. Silver had an advance to 32¼d. The Bank rate is 4½ p.ct., as fixed on Feb. 16.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Shares.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.e.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.e. Pref. .	...	50—55	...
1,551,868	,,	Oct. 13	2½	3 1/16%	Alliance & Dublin Ord.	59—64	60—65	62½—63
374,000	,,	Jan. 12	4	4%	Do. 4 p.e. Deb.	76—79	46—51	...
280,000	5	Nov. 30	7½	4/—	Bombay, Ltd. . . .	5½—6½	5½—4	...
100,000	5	Feb. 23	16	7 7/9%		...	9—10*	...
383,110	10	,,	7	7%	Bournemouth Gas and Water { 5 p.e. . . B 7 p.e. . Pref. 6 p.e. Deb.	15—15½	8½—9*	8 15/16—9
113,000	10	,,	6	6%		13½—14	7½—8*	...
162,065	—	Dec. 30	—	4%		...	65—70	...
992,045	Stk.	Feb. 9	14	56/—	Brentford A Consolid. .	261—266	82—87	84
734,920	,,	,,	11	55/—	Do. " B New .	204—209	82—87	85½
55,000	,,	,,	5	5%	Do. 5 p.e. Pref. .	109—111	70—75	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.e. Deb. .	91—93	68—72	70
214,775	,,	Aug. 26	11	10½%	Brighton & Hove Orig. .	208—213	145—150	135½—150
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	103—105	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max. . .	...	...	...
530,000	20	Sept. 29	12½	10%	British	44—45	27—29	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.e. Deb. Stk.	88—90	68—72	62½—70
245,771	,,	,,	4	4%	Buenos Aires 4 p.e. Deb.	85—87	52—57	...
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6—7	...
100,000	10	Oct. 28	—	4½%	Do. 4½ p.e. Pref. .	4—6	4½—5½	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.e. Deb. Stk.	70—75	58—61	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.e. Ord. . .	108—110	...	...
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.e. Stk.	106—108	77—82	78½—79½
560,000	,,	,,	5½	38/4	Do. 3½ p.e. do.	105—105	76—81	...
475,000	,,	—	5	5%	Do. 3 p.c. Deb. Stk.	69½—71½	53—58	54½—56
800,000	,,	Dec. 15	4	—	Continental Union Ltd.	76—79	18—20	18
200,000	,,	,,	7	—	Do. 7 p.e. Pref.	115—118	33—38	...
51,600	,,	Feb. 23	15	15%	Croydon A 10 p.e. . .	...	185—195*	...
278,400	,,	,,	12	12%	Croydon B and C 7 p.e. .	...	145—155*	150—151
492,270	Stk.	—	6	4½%	Derby Con. Stk. . .	125—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk. .	102—104	...	...
1,002,180	10	Jan. 26	10	5/0	European, Ltd. . . .	17½—18	8½—9½	8½—9
16,298,975	Stk.	Feb. 23	4/17/4	46/8	Gas { 4 p.e. Ord. . .	98—102	79—82*	79½—83
2,600,000	,,	,,	3½	35/—	Light { 3½ p.e. max. .	76—79	57—60*	58—59½
4,062,235	,,	,,	4	4%	and { 4 p.e. Con. Pref.	96—99	68—73*	69—69½
4,674,850	,,	Dec. 15	3	3%	Coke { 3 p.e. Con. Deb.	72½—74½	53—58	55½—55½
130,000	,,	Dec. 11	10	10%	10 p.e. Bonds. .	...	...	...
82,500	,,	Sept. 14	5	3 1/2%	Hastings & St. L. 5 p.e.	...	...	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	44—55	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16½	5½—6½	...
86,600	Stk.	Aug. 26	9	9%	Hornsey 7 p.e. . . .	...	100—105	...
131,000	,,	July 28	7½	7½%	Ilford A and C . . .	151—154	110—120	...
65,780	,,	,,	6½	5 1/2%	Do. B	115—118	96—101	95—100
63,500	,,	Dec. 30	4	4%	Do. 4 p.e. Deb. . .	92—94	60—65	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental .	150—160	145—150	142—145½
1,235,000	,,	Feb. 9	3½	3½%	Do. 5½ p.e. Deb. Red.	84—86	67—72	...
235,242	,,	Aug 26	6½	6½%	Isea Bridge Ord. 5 p.e. .	119—121	75—80	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.e. Ord. { A. B.	211—213 146—148	... ...	72½—72½
306,083	,,	June 26	4	4%	Do. 4 p.e. Pr. Deb. Stk.	...	...	...
165,736	,,	Feb. 23	7/5/6	6%	Maidstone 5 p.e. . .	...	53—55*	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb. .	...	43—46	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4½—4¾	2—2½	...
250,000	100	Oct. 3	4½	4½%	Met. of Melbourne { 4½ p.e. Deb.	99—101	93—100	...
541,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd. . .	11½—12	57—62	58½
1,875,892	,,	Feb. 23	4½	4½%	Newcastle & Gatsh'd Con.	98½—99½	72½—73½*	...
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.e. Deb.	82—83	64—66	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.e. .	...	12½—13	...
55,940	10	,,	7/14/0	5/3	,, ,, 7 p.e.	14—15	9—10	...
300,000	Stk.	Dec. 15	8	8%	Oriental, Ltd. . . .	117—122	84—87	...
60,000	5	—	10	—	Ottoman, Ltd. . . .	7½—7¾	2—3	...
188,120	Stk.	Dec. 30	—	6%	Plym'th & Stonch'se 5 p.c.	...	69—71	...
60,000	50	Aug. 26	13	60/—	Portsea Island, B . .	128—131	74—77	...
100,000	50	,,	12	55/—	Do. C . . .	118—121	41—54	...
249,980	5	—	8	—	Primitiva Ord. . . .	5½—6	1 1/16—1 3/16	14/—15/-
499,960	5	—	5	—	Do. 5 p.e. Pref. .	4½—5	2½—2½	42/6—45/-
321,600	100	Dec. 1	4	4%	Do. 4 p.e. Deb. .	91—93	74—76	74½
600,000	Stk	Jan. 26	4	4%	Do. ,, ,, 1911	...	52—57	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.e. Deb.	85—87	52—57	...
150,000	10	Sept. 29	6	6/—	San Paulo { 6 p.e. Pref.	10½—11	6—6½	...
125,000	50	Jan. 3	5	5%	{ 5 p.e. Deb.	47—49	36—39	37½
135,000	Stk	Aug. 26	10	5%	Sheffield A	223—224	68—70	...
209,984	,,	,,	10	5%	Do. B	222—224	68—70	...
223,500	,,	,,	10	4½%	Do. C	220—222	68—70	...
133,201	Stk	Sept. 11	4	4%	Shrewsbury 5 p.e. . .	...	...	...
90,000	10	Oct. 28	9	8%	South African	10½—11½	7—9	...
9,609,895	Stk	Feb. 9	5/4/0	5%	South Met. Ord. . . .	111—113	82—84	82—83½
250,000	,,	Jan. 12	—	5%	Do. Red. Pref. .	...	94—96	...
1,805,445	,,	,,	3	4%	Do. 3 p.c. Deb..	72½—74½	53—58	...
224,880	,,	Feb. 23	8½	8½%	South Shields Con. Stk.	157—159	99—101*	...
1,087,795	,,	,,	6	5 5/8%	S'th Suburb'n Ord. 5 p.e.	114—116	85—91*	89¾—90
568,837	,,	Dec. 30	5	5%	Do. 5 p.e. Deb. Stk.	116—118	78—83	79½—80
647,740	,,	Nov. 16	5	4%	Southampton Ord. . .	99—102	57—60	...
121,275	,,	Dec. 30	4	4%	Do. 4 p.e. Deb. Stk.	...	60—62	...
120,000	,,	Feb 23	—	7½%	Tottenham { A 5 p.e. .	135—138	87—92*	...
782,275	,,	,,	6	5½%	{ B 3½ p.e. .	115—117	77—82*	80—82
181,255	,,	Dec. 15	4	4%	District { 4 p.e. Deb.	87—89	68—72	...
182,580	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Aug. 26	5	5 1/2%	Tynemouth 5 p.e. max.	108½—109	67—69	...
30,000	,,	Aug. 11	8½	66/3	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.e.	131—136	84—86	...
255,636	,,	,,	6½	51/3	Do. B 3½ p.e.	129—134	68—71	...
108,075	,,	,,	—	46/4½	Do. C . . .	...	65—67	...
140,865	,,	,,	—	46/4½	New Ordinary . . .	...	65—67	...
552,000	,,	,,	6½	45/—	Wimbledon 5 p.e. . .	117—122	65—67	...
98,000	,,	,,	6½	50/—	Epsom 5 p.c. . . .	121—126	63—67	...
88,416	,,	Dec. 30	3	3%	5 p.e. Deb. Stk.	86—90	50—55	...

* Ex Div.

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